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EDITORIAL NOTES.

Your Aid and Support.

THERE has been great activity during the past few weeks in connection with the preliminaries for the National Gas Exhibition. The organizing machinery is ready, and has started work. Individuals are not sparing themselves. Several Committee meetings and conferences have been held, shaping and co-ordinating the first details. The architects, as our columns show this week, are preparing for approval plans that are to convert some of the "White "City International Exhibition Halls and Galleries" into places of great attraction and suitable accommodation. All this in the cause of each undertaking, and each manufacturer and salesman of gas plant and appliances, large and small! The matter was again removed from private to public discussion last week in connection with the meetings in London of the General Committee of the Exhibition and of the Society of British Gas Industries, both of which were held under the chairmanship of the President of the Exhibition, Sir Corbet Woodall. Much information can be obtained from the reports elsewhere; and now the time has come to make a substantial and settled advance in the matter. The principals and members of the whole scheme are now before us waiting for their final assembling and adjustment—waiting, owing to many undertakings being still undetermined as to what support, if any, they are going to accord the scheme. We should like before long to be able to write that there is not a gas undertaking in the United Kingdom that has not contributed its share on the lines of a guinea per 10 million cubic feet of gas made. No gas undertaking, however small, can regard this sum as being an onerous charge upon them in the work of promoting industrial interests; no gas undertaking can look upon the amount as a large price to pay for exhibiting an enterprise and taking part in the new life that is spreading and is going to rule, and to shape largely, the extended public service of our industry.

At one of the meetings last week, the Chairman of the Executive Committee (Mr. F. W. Goodenough) remarked that every contribution will assist to make the exhibition more complete, more attractive, and better known. The exhibition is one not merely for celebrating events—though important events in the history of the industry—but it is one that is intended to make people talk and believe through educational demonstration. But what are the gas undertakings doing to help to a conclusion the well-planned and comprehensive scheme that is now before us? A majority of them have not yet enrolled their names on the subscription list; and yet they must know that the ultimate end of the scheme is to make the roots of the gas industry sink deeper and spread wider into the soil of public service, so that the interests of the industry may grow more and more valuable, and become more and more invulnerable by competitive agencies. The manufacturers of the country have done well. Already their financial promises are approaching one-half of the estimated £25,000 with which the gas industry is proposing to stimulate the country by a display of unparalleled importance in its long history. But the gas undertakings—more numerous than the manufacturers, and with their growing and constant business—are not all evincing an equivalent interest; and a few thousand pounds are still required from them before the subscription lists can be closed, and they ought not to be closed with a single absentee. The gas undertakings that have subscribed have distant and near location; but many are the places between the subscribers in which the appeals for financial support still lie neglected and without response. Alderman F. S. Phillips, of Salford—the Chairman of a municipal gas undertaking—remarked at the General Committee meeting last week that this was an extraordinary state of affairs. It is. We ask the administrators of gas undertakings not to neglect the matter any longer, but to do their part, promptly and liberally, in making this demonstration a triumphant event in the opening of the second century of the gas industry under statutory powers.

There is no question that success is assured from the point of view of arousing public interest throughout the United Kingdom. A large number of distinguished men have given their support to the exhibition. The report of the Executive Committee included in our account of the meeting of the General Committee shows an excellent programme of functions that will accompany the main display and demonstration. The promoters want to gain the ears and eyes not only of the general public, but of those whose position enables them to exert influence to the advantage of the industry; and the industry must show them, by display, that it is not seeking their good offices under false pretences. To the exhibition will be invited medical authorities, those who are ardent in the smoke abatement movement, those who have taken up the professional duties of imparting instruction on cookery matters, those who have at heart the social and economic questions of the day, authorities on educational matters, manufacturers, the members of chambers of commerce, and those engaged in the science of applying artificial illumination. "Come and see, and let us talk over "matters" is what the promoters hope, by the universal support of all gas undertakings, to say to these influential ones. It is a big educational movement; and it is only by such work as this that ignorance and misconception can be eradicated. The exhibition too will be the scene of the annual meeting of the British Commercial Gas Association; and already there is talk of special excursions from many parts of the country. This is a big thing—the biggest in its line the British gas industry has ever tackled; and the plans for it are unprecedented in character. The ideal of co-operation, or co-partnership, in fostering the interests of the gas industry is spreading. It is not a mere sentiment or theoretical proposition; it is a practical actuality. Is there a gas administration that does not wish to make it more so? The exhibition subscription list will in due time supply the answer.

Relations of Statutory and Private Trading Enterprise.

THE year of Sir Corbet Woodall's presidency of the Society of British Gas Industries ended on Thursday last; and Professor Harold B. Dixon, Ph.D., F.R.S., extends the line of distinguished holders of the office. Sir Corbet, usually conventional in such matters, transgressed the orthodox procedure—more, if we remember rightly, through misunderstanding than otherwise—and made what should have been his inaugural address one that may be classed as valedictory; for its delivery was almost the last act in his official position in connection with the Society. The members, however, did not lose anything by the delay in hearing the presidential utterances, as we are inclined to think that, had there been an earlier composition of the address, the thought and ideas that are in places found in it would not have matured to the stage that they have done in the mind of the President. Experience and new events are conceptive factors. They produce new ideas, and enable us to expand them and to assemble them in their proper order. Had the gas-supply industry not been attacked by the private trading chemical manufacturers, whose commercial doings are subject to no law other than of their own making, except the one of supply and demand to which it is ever their effort to rise superior, there would have been lost certain experience which we trace as having been generative of thought that has place in the intellectual address that came from the President. Had coal prices been normal during the past twelve months, there would not have been the experience that has brought its illustrative lessons of how certain conditions, such as exist in

the coal industry, do enable the (under other conditions) controlling influences of competition and supply and demand to be set at nought. Thus we say the value of the address lost nothing by postponement.

In the address we have the relations of two classes of trading enterprise—the one statutorily restricted, and the other altogether untrammelled—brought into direct contrast; and considerations are applied to those relations that rise far above the scramble for the one making as much as possible out of the other, to the detriment of perpetual and mutual interests. The address came at a peculiarly opportune time, as no doubt some of those present recognized. It must be acknowledged by all, whether gas undertakings or those whose trade and well-being are dependent upon the gas-supply industry, that the major interest of both, reciprocal as it is, must be to place on as deep and broad foundation as possible the part of the industry—that of gas-supply—from which mutual prosperity springs; and this cannot be done if in any one part there is a constant desire to obtain an undue advantage over the other. For any part of the industry where this desire may, or is likely to, prevail, there is a note of warning among the presidential remarks: "We [the gas undertakings] must stand out for our right "to buy in the cheapest market that commends itself to "our unfettered judgment—as you will do." We cannot help thinking that it was no mere fortuitous thought that induced Sir Corbet to take the line that he did in this particular part of his presidential address, nor that it arose solely from the one or two events to which reference has already been made in this article; but that the combination of actually existing conditions in the gas industry and rumoured possibilities had their influence in directing the framing of the utterances.

There is no occasion here to remind of, but the President did well in reciting, facts that are in danger of being hidden in the commercial activity of the times—facts relating to the vast differences that exist between the statutorily controlled gas enterprise, and the private trading business free from Special and General Acts of Parliament. Capital limitation, price control, restriction of area, profits divisible between consumers and shareholders, and yet competition from other sources in all branches of the business, are, save in the last respect, the antitheses of the conditions that exist in connection with private trading firms. In the one there is a compulsory line of business; in the other there is no governing law that need be obeyed except the one of self-preservation, with behind it the force of competition, where the competition is a real thing. Having grasped this difference and what it means, there can be a better understanding of the plea that underlies the greater part of the presidential address, that mutual interest rather than the relative power of buyer and seller to enforce conditions should fix and animate the business associations of the two parts of the industry, and so promote fair dealing. As, however, we look at the history of the industry's affairs, and not far removed from the present, there are found incidents of commercial injustice on both sides; and Sir Corbet is not blind to them. But he sees no reason why all such unfairness should not be corrected by those immediately and solely identified with the gas industry; while in other larger transactions where the gas industry is dependent upon outside industry, he detects no reason why Parliament should not intervene and produce some revision of the present arbitrary and onerous circumstances. It seems only common-sense that, when Parliament imposes obligations, it should assist in defending the conditions necessary for the fulfilment of those obligations. In other words, there ought to be some ways and means of protecting a statutorily controlled industry such as gas supply against other industries that are legislatively untrammelled, and that have such control of supply—as in the case of the colliery owners—that they can largely defy the law of supply and demand, and by "under-"standings," if not rigid compact, can destroy the effects of the force of competition. Where there is free competition, without understandings, for the business offered by gas undertakings, the latter are in a strong position; and we regret when at times there is substantial evidence of their driving hard bargains. On the whole, however, gas undertakings are not difficult customers; and those who do business with them do not, as a rule, run any heavy risk. But let there be, as Sir Corbet puts it, that "objectionable con-"spiracy" of a ring or trust, or other form of vicious alliance or compact, so that prices are altogether removed from the operations of the law of supply and demand and fair competition, and competitive tendering is reduced to a "farce," then gas undertakings have a right to cry out and protest, and seek the lines of remedy. They have the power of resistance in the ordinary lines of their trading; but at the same time it is obvious that this power requires judicious exercise, so that private traders are not unjustly injured by impositions which they cannot avoid, and which increase their costs and outgoings.

There are, as Sir Corbet says, middle courses in all these matters which can be taken by the undertakings and business concerns, whatever their special nature, in such an industry as that of gas supply. The position free from legislative restriction of the trading section is one that places power in their hands; and the gas undertakings from their position are likewise strong, though not absolute. It is only where supply rests in the hands of the few such as in the case of collieries or special forms of construction that there can be any permanence of oppressive conditions. In all other ordinary circumstances, there are justifiable ways and means of getting round oppression or unfairness; but in the process some one must suffer. This is, however, not what Sir Corbet wants. As interests are mutual, and extensions of the gas-supply business depend on fair prices and good quality articles for its production and use, the way to the largest prosperity is not by any antagonistic route, but by that which promotes the largest measure of co-operation. Several other matters were dealt with in the address; but what has been said indicates the main theme. In it and its treatment, there is wisdom.

Practical Points, and the Coal Tax.

SUBJECT-MATTER of a varied nature was woven into the address with which Mr. H. O. Carr, the Engineer of the Wandsworth, Wimbledon, and Epsom District Gas Company, inaugurated his year of office as President of the Southern District Association. In the main, the address consisted of a selection of such practical points from the Wandsworth working as the President considered would have most interest for his fellow-members. Interest was expected from Mr. Carr, and expectation was realized; for the Company and works (considering now the old state rather than the enlarged new conditions), of which he is the executive chief, have an interesting history and standing among the London and Suburban companies. Gas is supplied by the Company at the lowest price in or about the Metropolis; and this is largely due to a succession of administration and technical work over a long series of years (with which work three generations bearing the name of Jones have been intimately associated) that has kept low capital expenditure and high efficiency in the very forefront. The works, too, being on the banks of the Thames have had an important advantage, of which greater use is going to be made under the new order of territorial opportunity.

There is not much of a controversial nature about the address. One cannot argue with a man who is able by superlative results to prove the wisdom of what he does. Wandsworth in the character of the works does not boast of anything out of the ordinary. It can only be said that the choice of plant depends upon full consideration of the triple conditions of initial cost, durability, and efficiency. High efficiency in some respects may be purchased at too great a cost both in regard to capital and maintenance; while, in other respects, efficiency may mean an excellent return on both capital expenditure and maintenance charges. That is where technical administration and engineering and managerial ability all come in. The Wandsworth Company have not yet seen fit to depart from the old ways of horizontal retort carbonization. But this does not bind them as to their preferences in the future. The latest adoption is still horizontal retorts, but of large sectional area, and with slightly curved bottoms. De Brouwer charging-machines are the vogue. The retorts are capable of taking 14 cwt. charges; and the curved bottoms have the double advantage of facilitating discharge, and rendering the coke of larger size. It is easy to see in the address that detail has here large part in the production of efficiency. It is illustrated in the section adopted for hydraulic mains, with the special view of aiding tar removal; in the economy and advantages derived from a powerful electrically-driven disintegrator for dealing rapidly with spent oxide; and in the adoption of the tunnel-system under the coal-stores. The last point, though not novel, is worth special notice. Through the tunnel the return of the coal-storage conveyor runs; and by its means, on sign of heating, the part that menaces can be promptly

removed to the retorts, without much laborious work, and so economically, through the bottom of the stores. This provision, however, does not eliminate the necessity for taking all advantage of the greater knowledge of the times as to the causes that produce the harmful and annoying effects of heating and spontaneous combustion, and attention to which causes greatly minimizes the chances of trouble.

The President took his hearers, and takes his readers, out into the district for other points. The changed conditions of our roadways—the greater and altered character of the traffic, and the stronger road crusts required, the one being more inimical to sound pipe-joints than the old conditions, and the other increasing labour and expense in connection with road openings and repair—causes the engineer to consider whether, in new or renewal pipe work, a fresh order of things in practice will not be preferable. Mr. Carr has found advantage from the duplex system of main laying; and he proves his case. In new streets he is laying his mains under the footpaths on both sides, and close to the houses. The first expenditure is probably rather more, but not much; and there are the compensations in regard to maintenance, reliable service, and comparative freedom from accident. The pipes can be laid at less depth than in the roadway. The paving-slabs of footpaths can be easily taken up, and as easily replaced. This is better than having to negotiate a greater depth with a macadam road, or a paved thoroughfare with a concrete foundation. The pipes are removed from the influences of vibrating traffic and the stresses occasioned by heavy vehicles. Shorter lengths of service-pipes follow; thus saving expense, danger, and leakage. These are real gains, as proved by comparative trials. In the address, too, we get an account of the victorious entry of the high-pressure system of gas-lighting for shop illumination; in the High Street, Putney, alone some 255 electric arc lamps having been vanquished by the newcomers. The high-pressure gas-lighting is popular among tradesmen wherever it goes, as the experience from different quarters of London and the Provinces proves. It is useful to get such experiences, as they are encouraging. Mr. Carr's remarks on the subject of gas-fires will claim the consideration of the makers. The brightness of a gas-fire doubtless helps to make them popular; but visual brightness does not necessarily imply greater heating efficiency, and that is the more material point when considering the relative advantages of the old ball fuel and the newer columnar fuel. We do not think that we have yet arrived at the ultimate type of fuel, although we must say that the "Metro" fuel, which the President describes, is very attractive, and, as far as has been observed, is as highly efficient as the columnar type. There is one other notable point; and it is that the consumption of gas in the Wandsworth area between the hours of 6 a.m. and 6 p.m. now exceeds 50 per cent. of the total output. This indicates the direction in which expansion is proceeding; and there is no reason why eventually the consumption of gas for lighting should not—though maintaining and probably increasing its present magnitude—represent but a small proportion of the whole.

There are in the address many other points of a technical and commercial nature; but we will leave them for another matter. In one place Mr. Carr registers his views upon that much discussed politico-economic question of a tax upon exported coal. He has chosen vivid pigments for the picture he paints in this relation. If what he says were all true, if the effects he portrays were assured, no Government, in the national interests, could stand against the widespread appeal for reimposition, and those politicians who argue that a tax, in reducing the export trade of the country, would be an economic mistake would find their position very unstable. We fully believe that for the country there are material advantages to be gained from imposing a tax; but we are inclined to think that, on a closer examination of the matter, the President will find that his picture is a little too florid. He believes that the tax would induce Continental factory owners to migrate to this country, and furnish additional revenue for the country by the establishment of factories here, and by causing the money earned to be expended here. The produce rather than the raw material would be exported; and, in short, there is no measuring where the good effect would cease. Before we can agree upon the validity of these effects, it is necessary to know for what purposes the coal now exported is used. Mr. Carr shows that Germany exports a large quantity of coal; but a considerable quantity of British coal is imported—we believe the import is less than the export. A large quantity of the coal imported has its destination a considerable distance inland; and it is the quality of the British coal that causes it to be preferred for certain purposes to the native material. As the investigation proceeds, we further believe it will be found that the greater portion of the coal—other than the steam variety—is consumed for various purposes in industries that are immovable. The industries that could migrate, if the manufacturers so willed, are for the most part satisfied with home coal. Therefore the fulfilment of the President's vision does not seem nearer attainment through the influence of a coal tax. In an address full of interest, this alluring picture is the only part that is open to rejection in the absence of more positive evidence. Saying this, does not remove the favour in which we hold a tax on exported coal. That is a question quite apart from visionary effects.

Low Temperature Coal Carbonization and the Del Monte Process.

MANUFACTURERS and users of vehicles driven by motors are, in view of the high price of petrol, anxiously looking to the carbonization of coal to provide them with a fuel which will relieve them from the thraldom and price impositions of oil combinations. But we are afraid the immediate outlook is not so promising as they imagine it to be. They recognize that, while the established systems of high-temperature carbonization can place a quantity of benzol on the market, the quantity is insufficient to have any material effect, as existing circumstances prove, in producing a mitigation of market conditions that will give substantial relief from the present onerous price of petrol. They have therefore turned their eyes (and are encouraged to do so by inventors and others) to low-temperature carbonization of coal to afford them that relief through the greater production of motor spirit per ton of coal; and they heartily welcome every process that presents itself with this desirable object in view. But it is too early to be highly optimistic over these processes; the safer course is to be hopeful without being oversanguine. It may be that some processes will in working prove superior to others; we cannot at present tell. There is, however, one of the processes—the Del Monte—which has obtained an amount of publicity exceeding any of the others, and concerning which the newspapers have given circulation to some very roseate accounts of its prospects. We are sorry that, at the present stage in experience, and with the most reliable data that are at command from trial working, we cannot endorse these roseate prospects—let us repeat, "at present"—from either the technical or the commercial point of view. Positive it is that, if this or any other process ever did succeed in producing all, or any considerable part of, the motor spirit required, the powerful controllers of the petrol market would see to it that their own operations made such processes a commercial impossibility.

The results obtained by the Del Monte process, as embodied in a trial plant, have been under investigation by Mr. W. J. A. Butterfield, M.A., F.I.C. His clients in the matter were the "Westminster Gazette," and not the inventors, or those who (we take it) will be eventually exploiting the process. His report has been published; and, while the journals associated with the motor car industry read it as showing large promise, we hardly think that those directly interested in the process will be thoroughly gratified with all that it divulges. Qualifications which disclose limitations are scattered throughout the document, as anyone with technical knowledge of carbonization can readily discern. At the same time, it cannot be said that the report is condemnatory, other than to the extent that it reveals the limitations of the process, and how dependent its commercial success is upon favourable market conditions, not only in respect of motor spirit, but of the other products of the carbonization of coal. It is only fair to point out that Mr. Butterfield's test results were obtained from a trial plant; and that, reading between the lines of his report, it would seem that there is yet work to do, within the lines of the patents, in so designing and operating the plant that greater efficiency may be secured. On the general subject of commercial efficiency as a carbonizing plant, the Del Monte people, we believe, claim that they can handle coal, and carry out their process much more cheaply, than gas-works can do with any of their systems. We do not think that Mr. Butterfield would subscribe to this contention. It is easy to see that the conditions surrounding the working of the process are such that there need be no idle plant; and,

in view of the treatment to which the gas is exposed (the treatment is an essential part of the process, and renders the gas practically useless outside the process itself), there are no gas-purification expenses. But, on the other hand, they have to allow for the distilling of the tar and the cracking-up of the oils, so that, on the whole, we do not see that they can work more cheaply than gas-works. If, however, we compare the process with that of the coalite people, both from the constructional and the economic points of view, it is superior. The small tubular retorts of the coalite process, with the propensity of all strongly caking coals to stick and so cause trouble in discharging, cannot compare with the larger and clean retorts used in the Del Monte process, which can be continuously or intermittently charged and discharged with the same machinery, and therefore with the same ease, as gas-works vertical retorts. On the other hand, with low temperature heating, and generally the system of heating peculiar to the Del Monte process, it cannot efficiently deal (as is clear from the report) with strongly caking coals; so that—and this is the first point against the system—the field for raw material has its limits.

Turning to the production and financial statements in Mr. Butterfield's report, it will be seen that he has taken the best possible view of the position on the trial results. We find him (in his desire to be fair) making such adjustments as he thinks allowable between the yields from the trial plant and those that he believes to be possible, with suitable coal, under ordinary working conditions and well-designed plant; and he also takes the excellent prices that are now ruling in the markets for sulphate of ammonia, pitch, and the other products. The figures are given in the abstract of the report in other columns; but with those adjustments, and the advantage of the present good market prices, Mr. Butterfield can only show a profit of 1s. 6d. per ton of coal carbonized. That is a different tale from some of those that have been published. Though improved working might contribute some advantage to the quantitative yields, the present high prices of the products cannot be looked upon as normal for the future.

So far we have seen that, for proper working, the system is not capable of the highest efficiency, except with coals of a suitable character—a good bituminous coal, not too strongly caking; and that, to obtain the narrow profits that Mr. Butterfield presents, it is necessary that sulphate of ammonia, pitch, and the other products shall maintain their present prices. One has to go back some eighteen years to find a price so high as last year's average for sulphate of ammonia. Another essential to profit production is that the plant should be set up near to the pit mouth (but not where such coal is produced as, say, the Durham varieties), and in proximity to a large town that would absorb a smokeless fuel of the kind produced. There is no assurance that a favourable market would be obtained for the fuel, as to realize the financial position in the report the market must be one that would obviate heavy expenses for conveyance and distribution of output. This brings us to yet another point, and that is that the spent material, as produced in the trial working, shows that some 80 per cent. of it has no more value as a fuel for domestic purposes than gas-works coke, so that this would have to meet the competition of the local gas-works production; and as to the remaining 20 per cent. (which represents the inner core, and less carbonized portion, of the charge, and therefore contains a larger percentage of volatile matter), its friable nature would in transport cause its reduction to something of less value than gas-works coke. There seems but little chance, therefore, of the public taking more kindly to the Del Monte coke than to gas-works coke. The drawbacks to commercial success appear to be many, basing criticism on the report alone.

But the drawbacks enumerated so far are not by any means all—as we see them. A fairly large yield of motor spirit can only be obtained by cracking the middle and heavy oils, and that is no part of the Del Monte process. But this secondary process of cracking will be quite feasible so long as 10d. per gallon, or thereabouts, *wholesale*, can be obtained for the motor spirit produced. How long this price would be realizable depends—not upon the law of supply and demand, but on those powerful magnates who rule the oil markets of the world. It will be seen that the profitableness of low-temperature carbonization of coal—under, at any rate, the system claiming consideration—relies so much upon other factors than that of the motor spirit that favourable opportunities would not be wanting to produce very disastrous consequences by running the price of benzol down to a low level simultaneously with the markets for sulphate of ammonia and the other products not being at their best. There is one other consideration. Benzol is above the specific gravity line which separates taxable from non-taxable motor spirit; but if benzol became a substantial competitor with, and displaced the use of, petrol, there is little doubt that the Government would soon consider the advisability of placing the 3d. tax upon the home-produced article as well as upon the imported one. Therefore, on our reading of Mr. Butterfield's report, it will be gathered that we are not, from the point of view of the Del Monte system presenting a good and reliable commercial proposition, at all favourably impressed by the trial results. Our surprise is that certain of the motor journals should see the matter in a different light; but it is clear that they have not taken into account all the factors and the proneness to variability of market conditions for the products other than motor spirit, upon all of which factors the final financial result depends.

The last point to which we now wish to refer is one only of technical interest in relation to carbonization, and does not bear much upon the general question with which we have been dealing, other than in respect of the disuniform character of the material resulting from carbonization. What Mr. Butterfield found appears to throw some light upon the controversy as to the travel of gas in the Dessau vertical retort. One of the main claims for the Del Monte system is, we believe, that the charge is subjected to fairly uniform temperatures. While there may be still closer approximation to uniformity when the process is worked continuously—continuous feed, and continuous discharge—the condition of the spent material as described in Mr. Butterfield's report shows conclusively that the temperature conditions in the retorts in which the trials were made are not uniform. There is very little external heating of the retorts; but producer gas (after flowing through a condenser and scrubber) is heated, and is then fed into the retort, passing "through the material, and collecting and absorbing all "the gases formed." The gas then passes through the condenser, where the condensable constituents are separated from it; the gas, thus impoverished, being passed through the scrubber again, and then recirculated. Now what do we find from Mr. Butterfield's report as to the condition of the material discharged from the trial retorts during his investigation? The outside portion of the material contained only 2·46 per cent. of volatile matter; while the core of the material was only partially carbonized, and contained 17 per cent. of volatile matter; or, as already stated, quite 80 per cent. of the material was no better than ordinary gas-works coke, while only 20 per cent. was of a character resembling coalite, and therefore (if not, on account of its friable character, reduced too much) should be worth something more than gas-works coke as a domestic fuel. But this only represents a fifth part of the whole! Now to carbonizers this variable condition of the material will show conclusively that the circulated heated gas passes mainly through the outer part of the charge near the walls of the retort, and only to a small extent through the central portion—this presumably being due to the pasty condition of the charge in its central part offering resistance to the gas. Thus is seen one reason why, if the highest efficiency is sought, a careful selection would have to be made of the coals used, as such coals as the bulk of the gas coals from Durham would prevent the uniform distribution of the gases through them. The bearing of this upon the travel of gas in intermittent verticals will be plain to technical readers.

The report by Mr. Butterfield will assist in showing our friends of the motor industry, if they will only read it correctly, what are the factors to be considered in ascertaining how far they can look to a low-temperature system of carbonization for relief from the bondage of petrol; and it should also be useful to the public generally in showing them the factors for consideration in gauging the chances of a commercial success.

Do High Makes Pay?

Reading the report of the meeting of the Waltham Abbey and Cheshunt Gas Company, we are struck by the remarkable gas make and sale figures per ton of coal carbonized. The question has often been raised whether high makes really pay; and the best answer that one can give to the question is that there are many gas companies whose financial condition to-day would not

be what it is were it not for their increased sales of gas per ton of coal used. It would not be difficult to point to some companies who, if their make had continued on the scale of (say) about half-a-dozen years ago, would not (with the increase of expenditure in the meantime) have been able to maintain their dividends, despite the improved conditions of the residuals markets. But the companies we have in mind have got nowhere near the gas production and sale figures per ton that we have just alighted upon from Waltham Cross; and we should like to know whether the figures have their equals anywhere else in the country. The gas made per ton of coal carbonized was 14,593 cubic feet; and the quantity sold and paid for was 13,580 cubic feet. We congratulate the Engineer and Manager (Mr. W. B. Randall). There are some of our readers who will probably be asking for an analysis of the gas, and its tested illuminating power and calorific value. Do this high make and sale pay the Company? Those who examine the accounts must reply in the affirmative. The revenue account in 1912 bore all expenditure; and the renewal fund account has been credited with an amount equal to 1 per cent. on the paid-up capital. As the Company have not placed anything to capital during the year, the amount allocated to renewal account might be, in a sense, regarded as the equivalent of a reduction of 1 per cent. of the capital.

Gas for Water Heating

The second of Mr. F. W. Goodenough's Cantor Lectures at the Royal Society of Arts was not a whit less interesting than the first one. It was opportune in several ways. The season approaches for the further development of the cooking load, and for advancing interest and adoption in the matter of the use of gas or coke for water heating. In the latter branch, there is no real smokeless competitor, nor any competitor—not excepting coke—with the same elasticity as gas. Electricity cannot compete; and there is no sane electrical engineer who can conscientiously say that it does. In their houses many electricians use gas; to their patrons they urge the use of coke, which for economy we admit is preferable for very large (but not for the limited and intermittent needs of small) establishments, though extensive establishments can be named in which the proprietors prefer the convenience of gas, though somewhat more costly. The lecturer tersely alludes to the various systems of water heating by gas. Only one word of warning has to be spoken; and it is that all fitters incur as Mr. Goodenough puts it, a grave responsibility where they fit a geyser in a bath-room without a proper flue-outlet.

And for Cooking.

On the subject of the competition of electricity with gas for cooking purposes, Mr. Goodenough was able, by sound reasoning, to easily brush aside the pretensions and absurdities of the electricians. The faith that is in the electrician as to the possibilities of electricity in this line of domestic work is in inverse ratio to the noise that he makes for the purpose of catching the public ear, and encouraging a temporary belief. The electrical cooking campaign has now been carried on sufficiently long to secure for it a sparse adoption; and gas authorities are already beginning to collect information as to the experiences and disappointments of those who have been tempted to expend money upon outfits and installation. Those who will not impart information are those who have some reason—probably a near association with electricity supply—for not divulging all they have learnt by experience. Mr. Goodenough dealt sharply with the humbug that has been scattered far and wide on the subject of meat shrinkage in the effort to develop an electric cooking business. The user of a gas-cooker can bake a joint, as desired, to, and between, the extremes of under done and well done. As to cost for fuel, electricity is a long way from being in the same street in point of economy with gas. The gas industry has not been idle in providing itself with necessary concrete answers to electrical imposture, for that is the only name for what has been going on.

Further Progress in Auckland.

About this time last year, the Auckland (N.Z.) Gas Company celebrated their jubilee; and, in noticing the proceedings at their fiftieth annual meeting, we had to record good progress in the past and active preparation for the future. The report of the fifty-first meeting which appears elsewhere bears evidence of further progress and of the continued desire on the part of the Directors to keep the works and plant in a condition to meet all demands upon them. Last year was a prosperous one for the Company, with successful development in every direction. There was an increase of 2053 in the number of consumers, and 1231 more gas-stoves were in use, or, as the Chairman put it, about four for every day in the year, except Sundays. This was truly, as he remarked, "an eloquent testimony to the growing recognition of the great advantages of cooking by gas." The works have been rather weak in the matter of storage, but this drawback will be remedied before next winter by the completion of a 2½ million cubic feet holder. In the manufacturing department, a start has been made with the house to contain the installation of vertical retorts on the Dessau system to which reference was made last year; and it is hoped that one or two settings will be ready for use in 1914. The Company are still burdened with heavy rates and taxes. Last year this item was £1000 higher than in 1910; and now it is £1102 more than in 1911, or equal to 2½d. per 1000 cubic feet of gas sold. But, as pointed out last year, while the Company are thus taxed, the Electricity Department of the city come off scot-free. If the Company were in this happy position, they could reduce the price of gas 3d. per 1000 cubic feet. As it is, they have granted concessions of 5d. and 7d. in two of their districts. A noteworthy feature in connection with the Company's business is the formation of a Gas Workers' Provident Association, which has been cordially supported by the Directors. The Company are fortunate in having a faithful body of workers, and able and energetic officers in their Engineer (Mr. James Lowe) and Secretary (Mr. W. F. Stewart); and, with the additional capital the Directors will shortly have at their command, it may be confidently expected there will be a very considerable development of the Company's operations in the future.

Curious Notions on Gas Measurement.

In another part of the "JOURNAL" will be found two extracts from a book published in 1841, containing particulars of the early gas supply of Glasgow and Hamilton. The historical facts are interesting; but some of those bearing upon the latter town are rather amusing. The price of gas at Hamilton in those early days was 10s. per 1000, or 1s. per 100, cubic feet; and it is explained that "every cubic foot is nearly equal to 5 Imperial gallons." As 500 gallons cost only 1s., this is at the rate of "about 3d. per puncheon." These comparisons are excusable in the case of writers in the days when the metric system was not so well known in this country as it is now. But what shall be said of a modern journalist who, a few years ago, in the course of a leading article in a newspaper published in an important Yorkshire town, told his readers that in Paris gas was being sold at 2d. a yard. Or of another who, in a paper circulating in Wimbledon, stated that a reduction of "9½d. per cwt." in the price of gas had been made by the Wandsworth, Wimbledon, and Epsom District Gas Company? This statement evoked from "Punch" the following: "We always put our gas in the scales before using it, to make sure we have not been given short weight."

The Gas Institution and the American Gas Institute.

There is reproduced in this month's issue of the American "Gas Institute News" a letter from Sir Corbet Woodall addressed to the President of the American Gas Institute, in which there is extended to members of that body a cordial invitation to be present at the Jubilee Meeting of the Institution of Gas Engineers next June. Sir Corbet Woodall also asks whether it would be possible for one of the members of the American Gas Institute to contribute a paper to this meeting upon some question of mutual interest connected with the industry. The Editor of the "Gas Institute News," remarking on the letter, says: "To those of our members who contemplate a trip abroad this year, this invitation gives an auspicious opportunity to attend the annual and jubilee meeting of this important Gas Association, under exceptionally favourable circumstances, with the knowledge in advance of a sincere welcome. The writer keenly remembers the cordial hospitality of a visit to one of the annual meetings of the Institution during an ordinary year, and is, therefore, in a position to promise still greater cordiality during the coming meeting. In addition to the courtesy extended in the invitation, the value of the opportunity is enhanced by the invitation extended for a paper by one of our members. The importance of this event makes it incumbent on the Institute, not only to send a representative delegation, but a paper of exceptional value and importance, adequate to the occasion, and one that will reflect credit on the Institute. Additional importance is attached to this event by the fact that very soon steps will be taken on similar lines in connection with the Gas Congress, when we hope to have visitors and papers from abroad, making the Gas Congress conspicuously international in character."

OBITUARY.

ULICK JOHN BURKE.

We regret to record the sudden death last Wednesday, in his seventieth year, from heart failure, of Mr. Ulick John Burke, the Deputy-Governor of the Gaslight and Coke Company. Mr. Burke was elected in February, 1868, a Director of the Imperial Gas Company, which was amalgamated with the Gaslight and Coke Company in 1876. He had therefore been a member of the Board for forty-three years. He was also Chairman of the Brentford Gas Company (having being elected upon the resignation of the late Mr. Howard Charles Ward in July, 1907), and a Director of the Lea Bridge District Gas Company. Deceased was called to the Bar (Inner Temple) in 1867; but he did not practise. He was a Justice of the Peace for Essex and Hants. The funeral took place at Newton Valence, where Mr. Burke resided, last Saturday afternoon.

PERSONAL.

Mr. James Large has been appointed Superintendent of Distribution to the Gas Department of the Rotherham Corporation.

Mr. Hutton, of Messrs. Alder and Mackay, recently underwent a serious surgical operation in an Edinburgh nursing home; but his many friends will be pleased to learn that he is making a most satisfactory recovery.

Mr. Dugald Clerk, D.Sc., F.R.S., has been elected a member of the Athenæum Club under the provisions of the rule which empowers the annual election by the Committee of a certain number of persons "of distinguished eminence in science, literature, the arts, or for public services."

The Edinburgh and Leith Gas Commissioners, at their last meeting, decided that the salary of Mr. James M'Gregor Jack, S.S.C., the Clerk, should be increased by £100, on condition that the fees chargeable against the Commissioners and contractors should go into a fee fund, and that the salary should cover everything except litigations or other legal work which Mr. Jack might be specially instructed to perform. This brings up Mr. Jack's salary to £500 per annum.

We congratulate Mr. Wilfrid Jolliffe, son of Mr. J. T. Jolliffe, of Ipswich, on his appointment to the position of Resident Engineer to the Harwich Gas Company—a post in which, owing to the rapid growth of Harwich and Dovercourt, he will no doubt have many opportunities presented to him. On leaving school, Mr. Jolliffe joined the Ipswich Gas Company; and subsequently he became a pupil with Mr. Harold W. Woodall—being fortunate enough to go to Bournemouth just when the new gas-works at Poole were commenced. He remained at Bournemouth for four years, and left on obtaining the appointment of Junior Assistant to Mr. John Young at the Hull Station of the British Gaslight Company, where he was for three years.

ELECTRICITY SUPPLY MEMORANDA.

Our friends of the "Electrical Times" are fond of heavy special numbers. They bring them out at intervals, with the view (among other reasons) of stimulating the electricity supply industry to do something better in a branch of their enterprise—particularly one that shows sluggish movement. They have published a "Special Cooking and Heating" number. It is a time-absorbing thing to read; and there is a little regret that we have spent some hours in ploughing through the pages, in order to save ourselves from the charge of doing an injustice by not considering the whole of the evidence. However, the result is that there is found little in the number that is new. For the most part it is a compound of already published information, plentifully garnished with odium and calumny for gas, and unstinted praise for electricity. But it has all been seen before in other dress; and one inclines to a feeling of drowsiness in going through it in search of something actually new. Of course, all the economy and other merit lie on the side of electric cooking and heating; all that is declared from the side of the gas industry in favour of its prime and popular commodity is said to be fallacious and distended beyond fact. The electrical case presented for cooking and heating in the special number, examine it as one will, is, in reality, a weakly constructed thing; and the attempt to make it look better by the application of gaudy colours is one of the pronounced features. However, "Meteor" thinks that the bulkiness of the matter scraped together indicates that electrical cooking and heating can no longer be regarded as a "side show." Henceforth (we suppose because of this heavy number of our contemporary) the development of the cooking and heating business on the large scale must be made the object of serious and persistent attention on the part of every electric supply manager who desires—not to maintain the status of his undertaking among other undertakings, but "his status among his fellow chiefs." That is a bit ponderous; but it indicates that the "Electrical Times" arrogates to itself the right to occupy the place of energizer of the dilatory and inappreciative managers of the electricity supply industry. In another place, it drops the *rôle* of the preacher, and adopts that of pleader for an immediate, united, and strenuous attempt to convince the present users of electric light that the electrical industry can supply them for other purposes at reasonable rates—reasonable rates! notwithstanding that the gas industry is said to be on the defensive, and losing ground more and more rapidly every day, under existing electricity rates.

Rechauffé.

Low Rates for Energy.

In the *débâcle* of old and familiar statements—in new diction, and partly leaning to the flippant style—this question of rates of charge takes a leading place. The fundamental importance of cheap units is insisted upon in any serious attempt to develop a cooking and heating business; but the greater part of the rest of the issue is directed to showing that there is not a shred of merit that gas can hang up alongside electrical cooking and heating. If this be so, where is the need for the gravity and insistence placed upon the question of tariff? Electrical undertakings are urged to adopt a very low rate for electrical energy for cooking and heating, despite the fact that there are electrical undertakings that have been impelled by the force of circumstances to strengthen the rates they are charging for power, and which use extends over several daylight hours. "With low rates, the electric age will then really commence." So that price is at the bottom of the competition; and all else about which so much is heard is but the embroidery employed by the electrical advocate. "Trim your prices to meet each branch of service" is, in effect, the advice given; and the advice is eloquent testimony to a knowledge of the economy of gas, though that economy is outwardly dismissed with an amount of bluster and wonderful—but very crude—calculations designed to show that gas cannot possibly do what it is doing every day. There is no need to argue over such posture on the part of any representative of a commercial rival. The electrical industry will do much better by listening to the steadier advice of Mr. J. Horace Bowden, of Poplar. This gentleman, in an article in the special number—while expressing belief that any undertaking supplying an area of moderate size can produce and distribute energy at a cost of under 0·3d. per unit, apart from *all* capital, establishment, and other standing charges, and with coal at normal prices—says that to ignore standing and other charges is to adopt procedure that is fundamentally unsound. He believes that progress in every shape or form points to an annual charge sufficient to recoup an undertaking for its outlay in capital and administrative costs, and to the adoption of a composite charge. This, however, he regards as being a transient expedient, and is sufficiently visionary to think that the ultimate practice of the electrical industry will undoubtedly be to assess each consumer at a given sum per annum, without taking into account his use of energy. There is also, in connection with cooking and heating, the cost of installation and renewal every ten years; and Mr. Bowden thinks an annual charge of 12½ per cent. per annum should be made for this. When the good time comes, when cooking and heating are not merely "side shows," there will also have to be further special capital expenditure on copper for transmitting the energy. After, however, constructing a case as to what should not be overlooked in the interests of sound finance in considering the cooking and heating question, Mr. Bowden admits that he is not yet satisfied with the efficiency and extremely heavy first cost of the cooking apparatus at present on the market, and so has not made any serious or organized effort to secure the demand. However, the "Electrical Times" cries: "The spoils of victory will transcend anything we have secured in the past."

Fabrication and Hallucination.

Apart from rates for energy, gas is (so our contemporary insinuates) quite out of it in the matter of heat control, compared with the electric cooker; and the large heat range possessed by the gas-cooker is but poor compensation. Then there is that marvellous desiccation ["Meteor" spells the word now without the double "s" and the single "c"] of the meat, or actual loss of solid "meat" in the gas-cooker, as contrasted with the electric-cooker. On the pots and kettles used over an atmospheric gas-flame, there is (as electrically imagined) such a mass of insulating soot, that the claim of gas to being an economical and rapid water heater is simply preposterous. All these points have been discussed before; but the wonder is that such fabricators as the men of the gas industry (as they are electrically represented to be) can keep together a living business with their crude appliances. Of course, the fact of the matter is that the fabrication is all on the side of the electrical pretenders. Our daily experience is the experience of millions of gas consumers in this and other countries—an experience transcending immeasurably anything that the electrical cooking advocates can bring in support of their false assertions. This experience shows that heat can be satisfactorily controlled in the gas-oven, the cooked meat is juicy and not desiccated, and pots and pans are not coated with soot, unless used alternately over the coal fire and the gas ring. What would happen under such circumstances with an electrical utensil, it is difficult to say. The intrusion of a little piece of grit between a pan or kettle and the electric heating element is disastrous to the desired result. While on the point of water heating, the "Electrical Times" again refers to the Peckham tragedy; and we may

repeat that the manner of doing so shows despicable meanness. The geyser in question, and the conditions of its installation and use, we have before pointed out to our contemporary, are not those that any gas undertaking would countenance. The meanness consists in ignoring this, and the widespread experience as to the positive safety of properly installed geysers. Abundant evidence is also found in the special number that for rapid water heating in bulk the electrical industry must depend upon gas or coke; and, to obtain the one or the other fuels, they will have to partially keep the gas industry alive. But it is a very limited service which some of these hare-brained gentry have allocated to the gas industry. There is one other miscellaneous point. Warning is given to electrical people not to accept challenges from the gas industry. The warning was not required. There have been several challenges, but no electrician, though the matter has been made a personal affair, has yet responded. But no electrical man has ever been courageous enough to issue a challenge to the gas industry. The "Electrical Times" insinuates that, if a challenge were accepted by anyone in the electrical industry, the gas challenger would use new appliances. We have no doubt that is just what the electrical man would do. We remember, however, one challenger who offered to use an old gas-cooker that he had had in use in his kitchen for years. Mr. Cramb has, by silence, declined to enter into a test with the writer, on well-known conditions, with metallic filament lamps and inverted burners *and mantles* that, we can now write, have been in daily use for over twelve months—their installation having been made on the first Monday in March last year, and there has not been the renewal of a single mantle.

Gas-Fires. It is observed that, in one part of the special number, isolated instances are quoted of gas-fires having been displaced by electric radiators. Gas undertakings are constantly displacing electric radiators. The Southampton Corporation Electricity Department recently increased their rental charges for radiators, and they make a rule under which users are bound to retain them for a certain length of time, owing to their propensity, after a trial on hire, to return the radiators. Gas-fires are, according to electrical notion, unhealthy things. Reference might be made by electricians to the paper read before the British Commercial Gas Association last October to ascertain the extent to which the medical men of London north of the Thames have taken to the gas-fire. The steep ascending line of gas-fire connections throughout the country, and the activity of the makers' shops, are a complete answer to the puny case of the electrical people. One writer in the special number complains that the troubles with electric cookers and heaters show that they are far from perfect. In another place, we are informed that with the electric radiator 1 watt per cubic foot of room capacity is the very minimum that should be allowed. But "it is far more satisfactory to everybody concerned if the rule be made a minimum of 2 watts per cubic foot, and 3 watts where wiring and other conditions allow." With such a rate, we are told, the consumer gets absolutely enthusiastic over his new comfort. Does he over his account? Three watts per cubic foot of room capacity would mean for one room of 2000 cubic feet capacity 6 units per hour. "Amusing and quite impertinent" is the description given to the heating efficiency claimed for the modern types of gas-fires. That was a matter dealt with in last week's "Memoranda." The "impertinence" is found on the side of the gas-fire detractors; the amusement on the side of the gas industry at the consummate folly of those detractors. "Meteor," too, believes that most of the duty of the gas-fire is "carried out" by means of convection; and that the gas-fire is a costly ventilator. Let him look at the radiating surface of a modern gas fire, and the construction of one; let him place his hands on the casing of a modern gas-fire in use, and then (without reference to the scientific tests carried out at the Leeds University) ask himself whether his commonsense alone does not tell him that the gas-fire is more of a radiator than a convector. Let him study the relation of the canopy of the gas-fire to the flue opening at the back, and then tell us what makes him think that the air current takes a tortuous route for the express purposes of depreciating the radiant efficiency of the gas-fire, and of giving the electrical people a point against gas heating. His argument might apply to the open bottom-barred coal fire, but it cannot to the gas-fire with its closed construction beneath the burner, and so without a vertically flowing air supply. "Technical" electrical journalism is evidently not improving.

B.Th.U. per Kelvin. There is another point to which "Meteor" calls attention. He suggests that it is high time that all people should agree to some definite figure for the amount of heat represented by a kelvin or kilowatt-hour. He gives the following collection of versions:

	B.Th.U.
C. R. Darling (Cantor Lectures)	3400
Professor J. A. Fleming (Cantor Lectures)	3402
Dawson's Pocket Book	3412
Foster's Electrical Engineer's Pocket Book	3412
Electrical Trades' Directory (Blue Book)	3440
Recent Paper at the Institution of Electrical Engineers	3445
Foster's Pocket Book (another page)	3600

He thinks that the differences may be partially accounted for by the determination of the calorific value at different levels of the thermometer. Quite possible. But if we eliminate the last line, the remainder are all 3400 and a little above; and the percentage differences are too small to provoke any serious quarrel. The matter, however, is regarded as more important for the electrical industry than for the gas industry, who supply round about 16,000 B.Th.U. for a penny with the price of gas at 2s. 6d. per 1000 cubic feet.

Nearing the Truth. At the advent of the electric cooking campaign, the electrical people came out with the striking invention that, by baking meat in an electric oven, there was a great saving of shrinkage, or, as some put it, of "loss of meat," worth 9d. to 1s. per lb., as compared with all other means of baking. Gas was a bad sinner in respect of running off with the nutriment of meat. We asked in vain for an explanation of this. Electrical people simply persisted in the fraud upon public intelligence. But they are gradually allowing sense to assist them in withdrawing from an untenable position. We have often enough sought to find out why they imagine the temperature of a gas-oven cannot be regulated in a manner so that the same effects in this respect can be secured as in an electric-oven; also why they think there is not outside coagulation of meat in a gas-oven on the starting of baking, so as to prevent the juices escaping, and why lower temperature cannot be employed subsequently for completing the baking. That is the course advocated by our professional teachers of gas cookery. Last week we saw that the "Electrician" is tiring of this nonsense of electric cookery demonstrators, and now Mr. F. S. Grogan, of "Tricity" fame, is receding from his old ground, and so is getting nearer the truth. In the discussion on Mr. T. P. Wilmshurst's paper (which was referred to last week) Mr. Grogan made this declaration: "He had formed the opinion that the saving with the electric method was entirely due to their ability to alter quickly the temperature in the oven. The meat was first seared for a short period at a high temperature, and then cooking was continued at a much lower temperature. *Such a saving could be effected in the older methods of cooking;* but only with an infinite amount of care on the part of the cook, and continual attention to the oven during the cooking operation. That was why electric cooking would always win, because this saving could be effected without any attention on the part of the cook." This at any rate is something for Mr. Grogan to concede. But a little later in his remarks he stated that at his electric demonstrations he invariably cooked a joint of meat for the public to see for themselves "the great saving." Does he also cook one in a gas-oven to show that "such a saving can be effected" with at any rate one of the older methods of cooking? One word about this quick temperature change in the oven. When we remember the old argument about the "Tricity" oven and heat retention, the thought just passes through one's mind as to how the high heat can make such a rapid flight to a heat of lower degree.

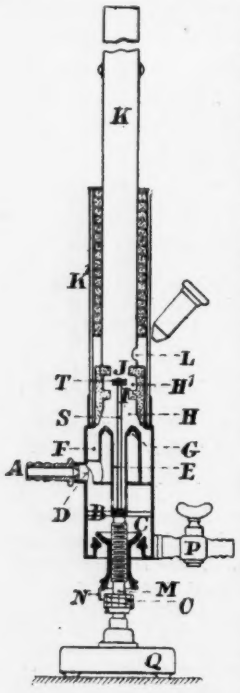
Beyond Question. Some of the electrical journals follow the lead of the postulations of certain of the men with electric-cookers to sell with an obtuseness that is perfectly ludicrous. There is our ponderous friend the "Electrical Review" writing on the subject of cooking, and playing the game of following the electric-cooker leader, without stopping to exercise its own mental powers a bit. It has the graciousness to acknowledge the splendid pioneer work of the gas industry in causing a change-over from the use of sold fuel to gas for culinary purposes; but it adds that this work will cause users of gas-cookers to "find it a short and easy step onward to the greater convenience and efficiency of the electrical apparatus, which is free from the offensive fumes and dirt which, beyond question, are the usual accompaniments of a gas-cooker." We are of opinion that the statement is not "beyond question." Offensive fumes and dirt are just as much the usual accompaniments of an unclean electric-cooker as of a gas-cooker; and we have yet to learn why a gas-cooker cannot be kept as clean as an electric-cooker. "Electrical Industries" says that "no one will seriously dispute Mr. Wilmshurst's claim that, with electricity at ¾d. or ½d. per unit, as is now charged in some towns, there is no question of the economy of electric cooking." The gas industry does, and has been for some time, seriously disputing the point; and certain reasons for this can be found in the paper to which allusion is made.

Design of Water-Pipes and Culverts.—In a paper read at a meeting of the Institution of Civil Engineers of Ireland, in Dublin, Professor Alexander, of University College, Cork, dealt with "The Design of Water-Pipes and Culverts for Maximum Efficiency;" examining the principles governing the flow of water, and showing how these should influence the designs of culverts and pipes, or certain parts of them, when the aim is to secure the maximum discharge with a given head or gradient. He said it would be a great advantage to Great Britain and Ireland if responsible people could be brought to realize what had long been grasped in Germany, that universities were places not only for the training of professional men in the elements of their work, but also centres for study, investigation, and experiment by competent persons with adequate apparatus and equipment. Engineering laboratories, properly manned and furnished, should be always at hand, so that practising engineers might investigate the problems which they were constantly meeting in constructional work.

A VERTICAL COMBURIMETER.

It may be remembered that at the last meeting of the Société Technique du Gaz en France, M. André Grebel submitted a paper on the subject of "Comburimetry"—*i.e.*, the measurement of the air or oxygen required for the complete combustion of gas. A translation of the paper was given in the "Journal" for July 2, 1912 (p. 44), and in it the principles of comburimetry and an illustrated description of the instrument devised for the carrying out of the tests will be found. Since then, as the result of a number of experiments, the makers (MM. Velter et Cie., of Paris) have adopted the vertical form and greatly reduced dimensions for the testing and combustion chambers, in order to attain the right temperature with a small consumption of gas per hour. The modified form of instrument is described and illustrated by M. Grebel (who, we are pleased to learn, has been nominated by the French Government an "Officier d'Académie") in an article in the "Journal de l'Eclairage au Gaz" for the 5th inst., and from it the following particulars have been taken.

The apparatus, shown in section, consists of a gas inlet A and an air inlet B. The latter can be hermetically closed by a conical valve C, which screws upon a central rod M supporting the instrument. Its displacements are marked by a needle N, which moves in front of a drum O, divided into 15 parts; each vertical division corresponding with 0·1 mm. turn of C. Generally speaking, the air necessary for the working of the comburimeter is brought in, by the suction of the chimney K, through the constricted annular orifice between the valve and its seat; but a side tap P allows of air in determined quantity being admitted to the chamber B when the valve is blocked. In this chamber, a portion of the admitted air can penetrate to the injector D, feeding the burner G. The rest passes into the central space E and the annular space F through suitable orifices, which may vary according to the character of the gas to be tested.



The mixture of primary air and gas, prepared in the injector D, leaves by the burner G, enters the combustion chamber H simultaneously with the secondary air entering at E and F. The combustion chamber, which is lined with asbestos, consists of two compartments H H¹, separated by a contracting-piece I, formed by a fire-clay diaphragm with calibrated orifices, the object of which is to stir up the gaseous mixture. It ends in a restricted orifice J, also formed of a calibrated diaphragm. In the compartment H¹ (intended specially for testing the combustion) there is a central support S, of nickel, for the reception of a small cupel T, composed of special earth possessing the property of absorbing oxides of lead. In this cupel is placed the lead pastille which plays a not unimportant part in the tests. A blackened copper chimney is arranged upon the combustion chamber. It is composed of a central tube provided with a sight-hole L. The bottom part is surrounded by a cylindrical glass sleeve K¹; the union of the two being assured by a long joint composed of plaited asbestos. The whole can be raised like the chimney of an ordinary burner. It is fixed to the foot Q in such a way as to avoid all re-entrance of side air.

The apparatus is, to all intents and purposes, a small gas-furnace with a vertical burner. The air necessary for combustion may be simply aspirated by the chimney or admitted by the tap P after having been measured by a meter. The mixture burnt in the combustion chamber heats the cupel, which is entirely surrounded by the products of combustion. The pure lead which it contains melts, and indicates at every moment, by the appearance of its surface, whether the medium in which it is placed is a reducing or an oxidizing one. In a reducing atmosphere, the bath is brilliant, and appears darker than the cupel; it reflects the sides of the furnace like a mirror. In an atmosphere slightly oxidizing, the surface is rapidly covered in all directions with tongues of coloured oxides. With very slight variations in the output of gas or air in the neighbourhood of perfect combustion, there is a very distinct change from one aspect to the other.

For average town gas, the valve C is left open exactly two turns, and the gas consumption corresponding to perfect combustion, is about 90 litres (3·17 cubic feet). With the burner in its ordinary working condition, the burnt gases being merely reducers, the output of gas is slowly lowered till clouds of litharge show a tendency to form. It is at this limit that it is necessary to maintain the output of gas during the period of the test, which should be made, for example, on 6 litres (0·2 cubic foot) of gas. By means of a seconds watch, the time t necessary for the flow of this quantity of gas, which is usually about 4 minutes, is taken. If the natural suction of air, with the valve open two turns, is (say) 500 litres (17·65 cubic feet) per hour under normal working conditions, the comburivorous power is deduced from the number of seconds by the following formula:

$$\frac{500}{\frac{21{,}600}{t}} = \frac{t}{43{\cdot}2} = 0{\cdot}023148 \times t.$$

Example: When $t = 240$ seconds, the comburivorous power of the gas tested is 5·555; when $t = 225$ seconds, 5·2083; and when $t = 265$ seconds, 6·1342.

M. Grebel gives directions for mounting and using the comburimeter; and these are doubtless supplied by the makers to purchasers of the instrument. He says professors of repute and French and foreign gas engineers are taking an interest in the comburimeter; and trials of it have been commenced in several well-equipped laboratories. The endeavour of the makers has been to produce an instrument which shall be at once simple and practicable, capable of being placed in all hands, and purchasable at a reasonable figure.

BORNKESSEL BURNERS AND BLOWPIPES.

It was primarily with a view to its use in connection with the glass industry that Herr Paul Bornkessel, of Berlin, devised his patent burner; and so great has been the success of his invention that it is now said to be in use in practically all German glass works. The burner is not yet so well known in this country; but that is a defect which it is hoped to remedy in due course. Messrs. C. Melin and Co., of No. 7, India Street, Crutched Friars, E.C., who have been appointed sole agents, have issued a pamphlet showing, by means of a number of illustrations, the wide adaptability of the principle involved in the patents; and they draw attention to the fact that the use of the burners is by no means confined to glass working now, as they are also employed for soldering, tempering, &c., in the metal industries.

The burners are formed so as to produce needle-pointed flames; and, according to the purpose for which they are required, they can be arranged in long or short straight rows, vertical or horizontal, or in full or semi circles. They are suitable for coal gas or other gas; but it is necessary to state in the first place what gas is going to be used with them. The gas is supplied at ordinary pressure, and the air is compressed; the mixture taking place just at the point of combustion. There is an outer tube round the inside of which the gas passes; and the compressed air is forced through a number of pin-holes in an inner glass tube. The mixture then takes place at the top of the glass tube, which is a trifle shorter than the surrounding metal. Some of the glass tubes have in them eight pin-holes, and others sixteen. Each nozzle is fitted with a regulator, to give a flame of the length required; and the burners can be arranged so that all the flames impinge on one spot. Where a large flame is desired, the inner glass tube is made with one big hole in it. The blowpipes are very light, which is urged as one of their advantages. And from those who have already bought the burners, the agents state that they have received repeat orders. The main points which are claimed in favour of the principle are considerable savings in gas, time, and wages. In fact, the statement is made in the pamphlet that in some instances the gas saving amounts to 90 per cent., and the output is increased six fold. If this is the case, glass-workers, and others having any use for an appliance of the kind, should find the invention well worth further investigation.

There is also, we learn, a new bunsen burner, called the Bornkessel Blue-Flame Burner, which will, it is anticipated, show a great saving on the ordinary form—using about 50 per cent. less gas, and giving a greater heat. This, it is gathered, is very like the Méker burner, except that it will cost about half the price.

New Edition of Lunge's "Sulphuric Acid and Alkali."—We have received from Messrs. Gurney and Jackson, of Paternoster Row, E.C., the latest edition of the first volume of the above-named book, which has been revised and very much enlarged, making it practically a new work. There are three parts, and the price is £3 3s. net. A review of the book will appear in an early issue of the "Journal."

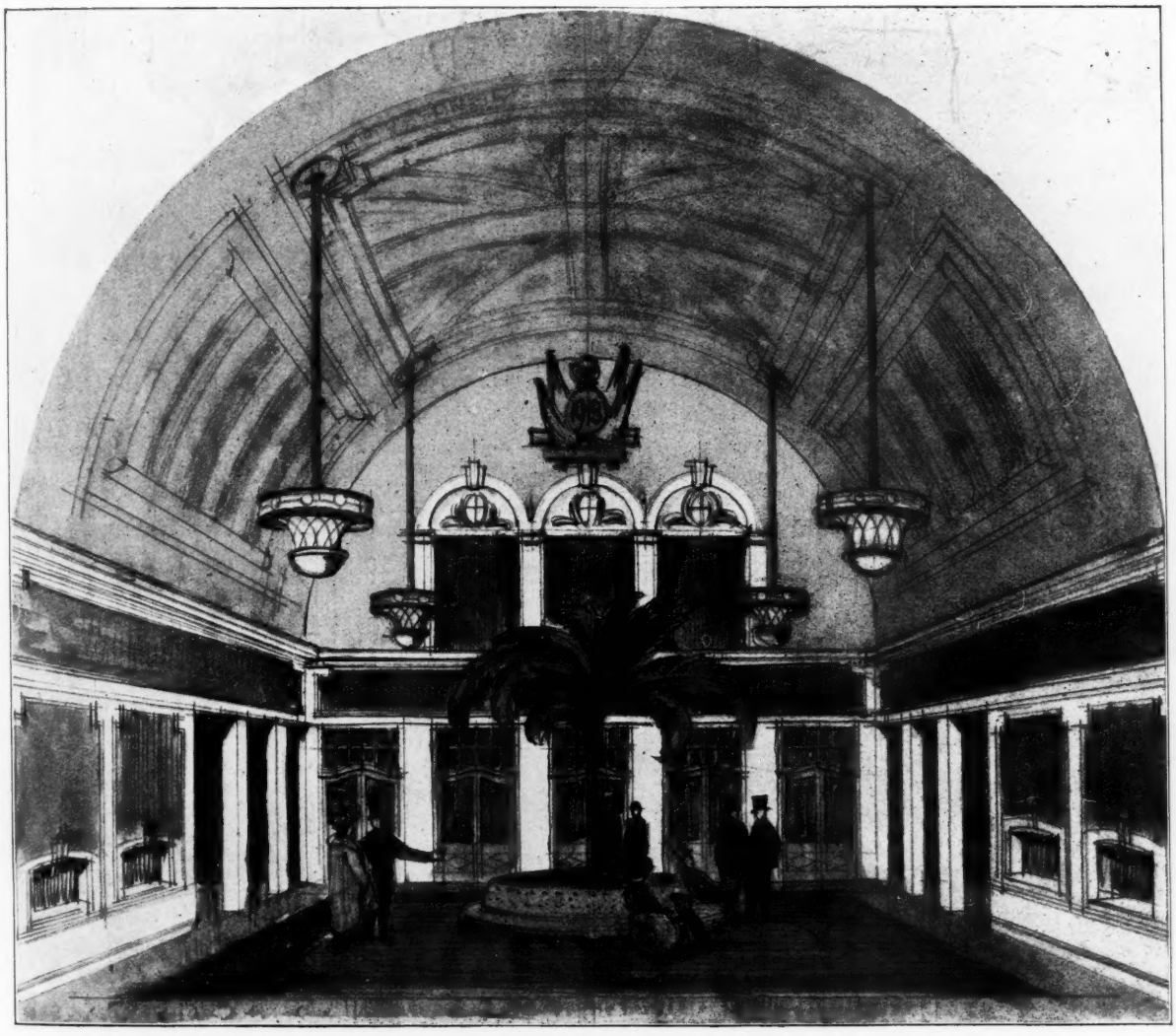
"Chemical Trade Directory for 1913."—We have received from Messrs. Davis Bros., of 265, Strand, a copy of this work. It is the fifth edition of the "Directory," which has been in existence for nearly fourteen years. The general arrangement of the book has not been altered; but many additions have been made to both the alphabetical list of names, with addresses, and the classified lists of chemical products, &c., with the names and locations of the makers. Part III. of the "Directory" (introduced in the fourth edition) contains a quantity of useful information, including diagrams showing the fluctuations in prices of metals, acids, tar and ammonia, and heavy and miscellaneous chemicals; also tables giving the figures of the exports and imports of chemicals and allied products for the three years 1909-1911. The price of the book is 10s.

THE NATIONAL GAS EXHIBITION.

A SELECTION FROM THE SUGGESTED PLANS AND DRAWINGS OF THE ARCHITECTS.

At both the meetings of the General Committee and of the Society of British Gas Industries last week, there were exposed for inspection some of the provisional plans that have been prepared, in connection with the scheme for the National Gas Exhibition, for converting the buildings that are to be utilized at Shepherd's Bush into places attractive and suitable for the purpose. The drawings and plans necessarily make a large bundle; for it is a big job that has been taken in hand. But Messrs. Warwick and Hall, the Consulting Architects, have, as the drawings indicate, got a good hold of the spirit, intention, and requirements. From the drawings we have made a selection, for the information of our readers; but it will be quite understood that the plans are provisional, and subject to modification and confirmation by the Committee in charge of the details. The object of attracting the public is being kept well in view. The environment of a display of this character is an important element in success; and that element is the first thing to be assured in dealing with organization, in view of the certainty of equipment under the circumstances of co-operation.

It might be a convenience if it is again mentioned that the exhibition is under the direct auspices and control of a General Committee representing the Institution of Gas Engineers, the British Commercial Gas Association, the Society of British Gas Industries, and the Gas Undertakings of the United Kingdom. The President is Sir Corbet Woodall, J.P., D.Sc., M.Inst.C.E. The Hon. Secretary is Mr. Walter T. Dunn, of 39, Victoria Street, S.W.; the Organizing Manager is Mr. Frederic W. Bridges, of 124, Holborn, W.C.



THE SUGGESTED TREATMENT OF THE ENTRANCE HALL.

[The above sketch and the plans and sketches on succeeding pages are from Provisional Plans prepared by Messrs. Warwick and Hall, Consulting Architects, 13, South Square, Grays Inn, W.C.]

Meeting of the General Committee.

A well-attended meeting of the General Committee of the National Gas Exhibition was held at noon last Thursday, at the Trocadero Restaurant, Piccadilly Circus, W., for the purpose of electing a Chairman and Vice-Chairmen, and to receive the following report of the Executive Committee. The chair was taken by Sir Corbet Woodall, D.Sc.

Election of Chairman and Vice-Chairmen.

Mr. Thomas Berridge said he had pleasure in moving the first resolution, to the effect that the Senior Vice-President of the Institution of Gas Engineers, Mr. Edward Allen, be appointed Chairman of the General Committee; and that Mr. John Bond (the Junior Vice-President of the Institution), Mr. William D. Helps, Mr. H. James Yates, and last, but not least, their friend Mr. F. W. Goodenough (on whom would fall, and had fallen, the bulk of the work, and who did it so well) be appointed Vice-Chairmen.

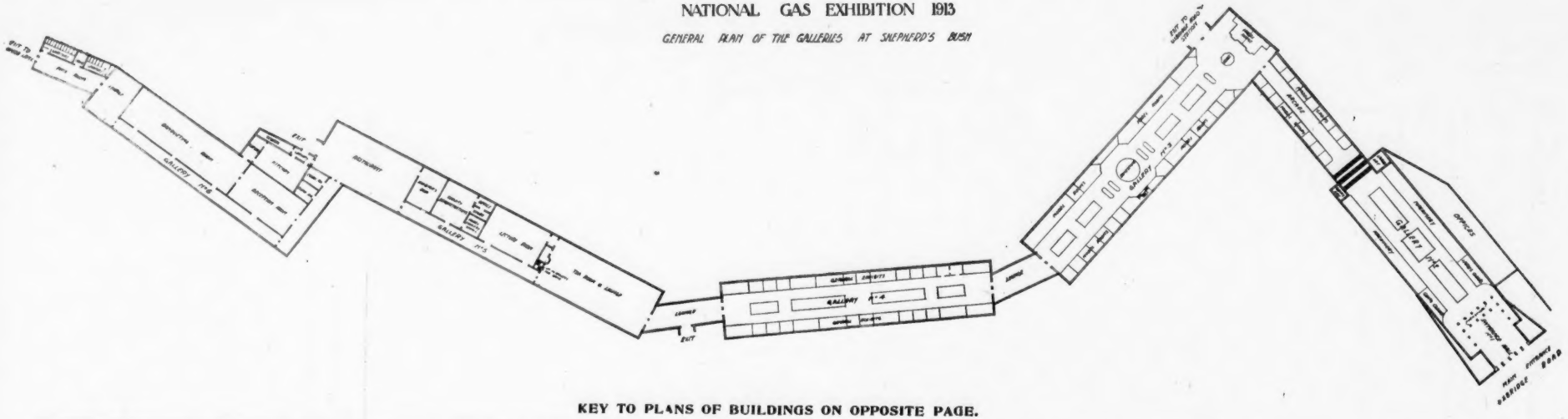
Mr. T. S. Clapham seconded the proposition, and it was very cordially agreed to.

Some Remarks by the President.

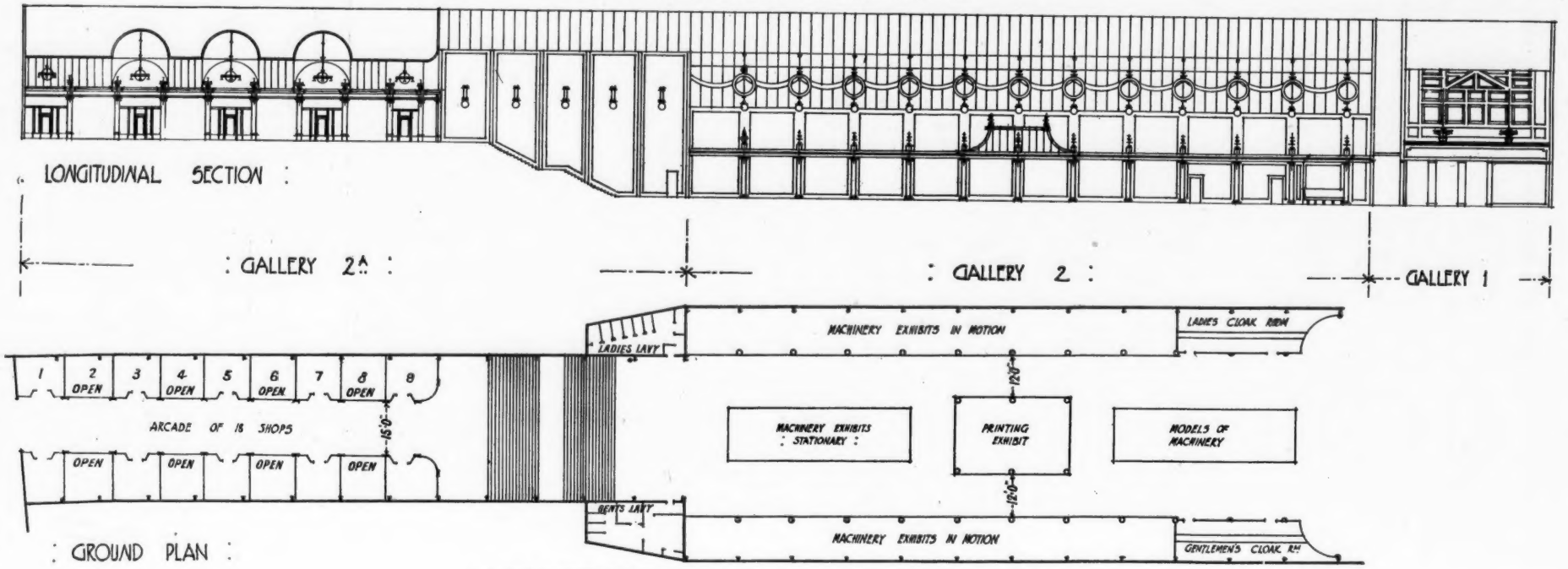
The President said he had very few observations to make. His principal and pleasurable duty was to welcome those present, and to say how pleased the Committee were that so many had been able to attend. He was sure it would be their wish to send to the recently-elected Chairman of the General Committee, Mr. Edward Allen, an expression of their sympathy with him in the work which he had in hand, and which had kept him away from the meeting. The report of the Executive Committee would be submitted in due course; and he thought they would feel that, at

NATIONAL GAS EXHIBITION 1913

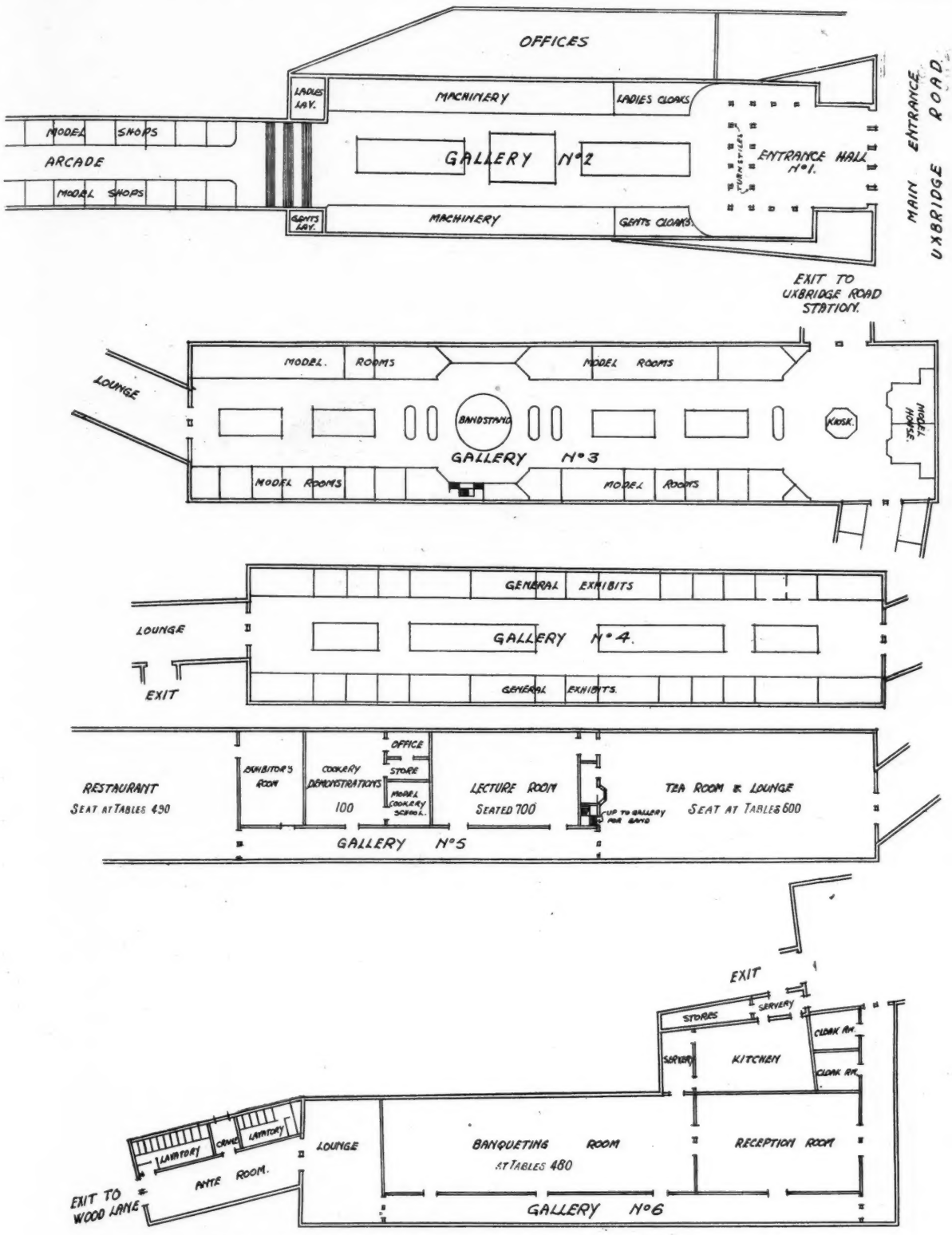
GENERAL PLAN OF THE GALLERIES AT SHEPHERD'S BUSH



KEY TO PLANS OF BUILDINGS ON OPPOSITE PAGE.

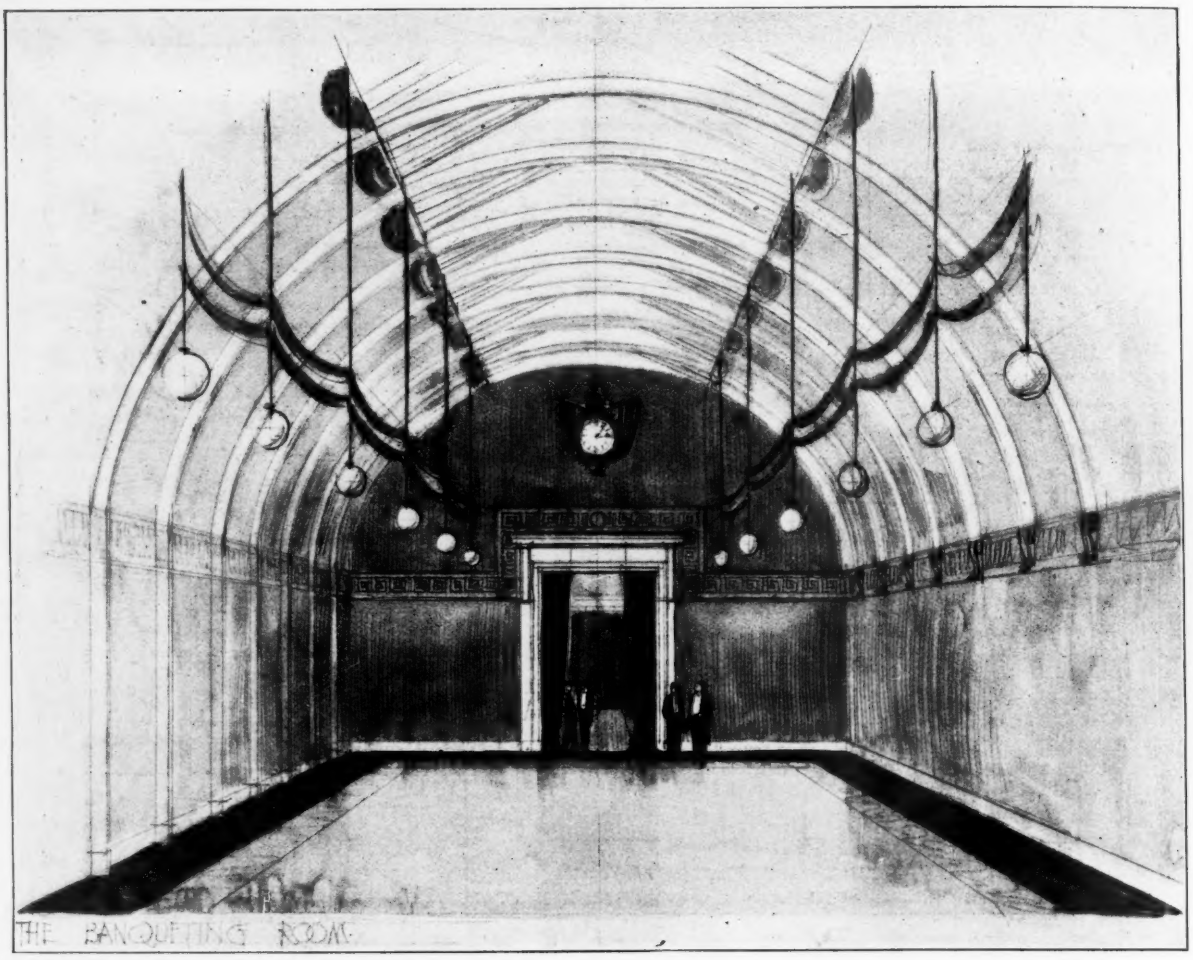


A SAMPLE COMPLETED SCHEME (SEE TOP DRAWING ON OPPOSITE PAGE).



ENLARGED PLANS OF BUILDINGS (SEE KEY ON OPPOSITE PAGE).

any rate on paper, a very great deal of good work had been done. Personally, he had little doubt, from what he had gathered of the manner in which the work was being conducted, that this paper programme would soon be crystallized out into actual work that could be seen. There was one point of material importance which he ought to refer to. This was that the expenditure necessary to carry out the scheme would be, as had been stated from the beginning, a very large one, and it would have to be clearly understood by all those who were subscribing to the guarantee fund that their names would not appear merely as an expression of friendliness towards the scheme, but that the money would actually be required. He mentioned this particularly just now, because speaking at a Board of Directors on the previous day he rather committed himself to the idea that there might be a fair proportion of the money returned. In consultation that morning, however, it seemed that this was almost certainly a mistake, and that a very large amount at any rate of the money guaranteed would have to be called upon. The idea, as they knew, of this exhibition was that of co-operation all round; and it was extremely gratifying to find that throughout the whole of the manufacturing industries associated in the promotion, the scheme had been accepted in the most cordial, hearty, and complete manner ("hear, hear"), and that individual effort in the direction of promoting the success of particular firms had been subordinated entirely to the great good that all felt would attach to the success of the exhibition. It was generally realized that the full measure of this success would not be that recorded at the date of the exhibition, but that the beneficial effects would continue to be felt as time went on. A question had been raised as to whether the amount of the subscriptions of manufacturers would total to as much as would have been received from the rent of spaces had the co-operative idea not been carried out; and it was satisfactory to know that, not only would it be quite equal to what this revenue would have been, but it would be considerably in excess



of it. He was very sorry that the contributions of gas undertakings had not come to as large an amount as it was felt they had a good right to expect; and he could only ask again that those representatives of gas companies who were present would not be content simply with securing a contribution from their own particular company or corporation, but that they would do their utmost among friends to ensure that the scheme of the exhibition was brought home to others. He understood that only about 200 gas undertakings had so far subscribed. As there were some 1700 altogether, this was a very small proportion indeed; and had their friends the manufacturers subscribed in only the same proportion, the exhibition would have been an impossibility. The suggestion was constantly made that those undertakings which were far away from London had not the same interest in the exhibition as those near at hand would undoubtedly have. He felt convinced that this was a mistaken point of view. The influences of the exhibition would be very wide-spread. There would be a considerable number of people up from the country in order to attend it; and, besides, it was hardly necessary to repeat that the success of the industry (say) in and around London had, in a greater or less degree, an effect in the furthermost parts of the country. He would now ask Mr. Goodenough, the Chairman of the Executive Committee, to submit the report.

Report of the Executive Committee.

The report, which had previously been circulated among the members, was in the following terms:

In presenting a brief report of the progress so far made with the arrangements in connection with the forthcoming National Gas Exhibition, the Executive Committee, to whom has been entrusted the carrying out of the scheme, have much pleasure in stating that everything augurs well for the success of the undertaking.

Patronage Extended to the Exhibition.—The Executive Committee feel that the preliminary list of patrons will be regarded as eminently satisfactory, representing as it does every branch of municipal, educational, public, and social life.

Exhibition Buildings.—Contracts have been entered into between the Institution of Gas Engineers and the Shepherd's Bush Exhibitions, Limited, for the renting of the first six halls and the intermediate annexes connecting the Uxbridge Road entrance to the White City with the Wood Lane entrance. These halls comprise a floor space of some 125,000 square feet. An insurance policy has been effected to protect subscribers against loss in the event of any accident occurring to prevent the exhibition being held at the time and place proposed.

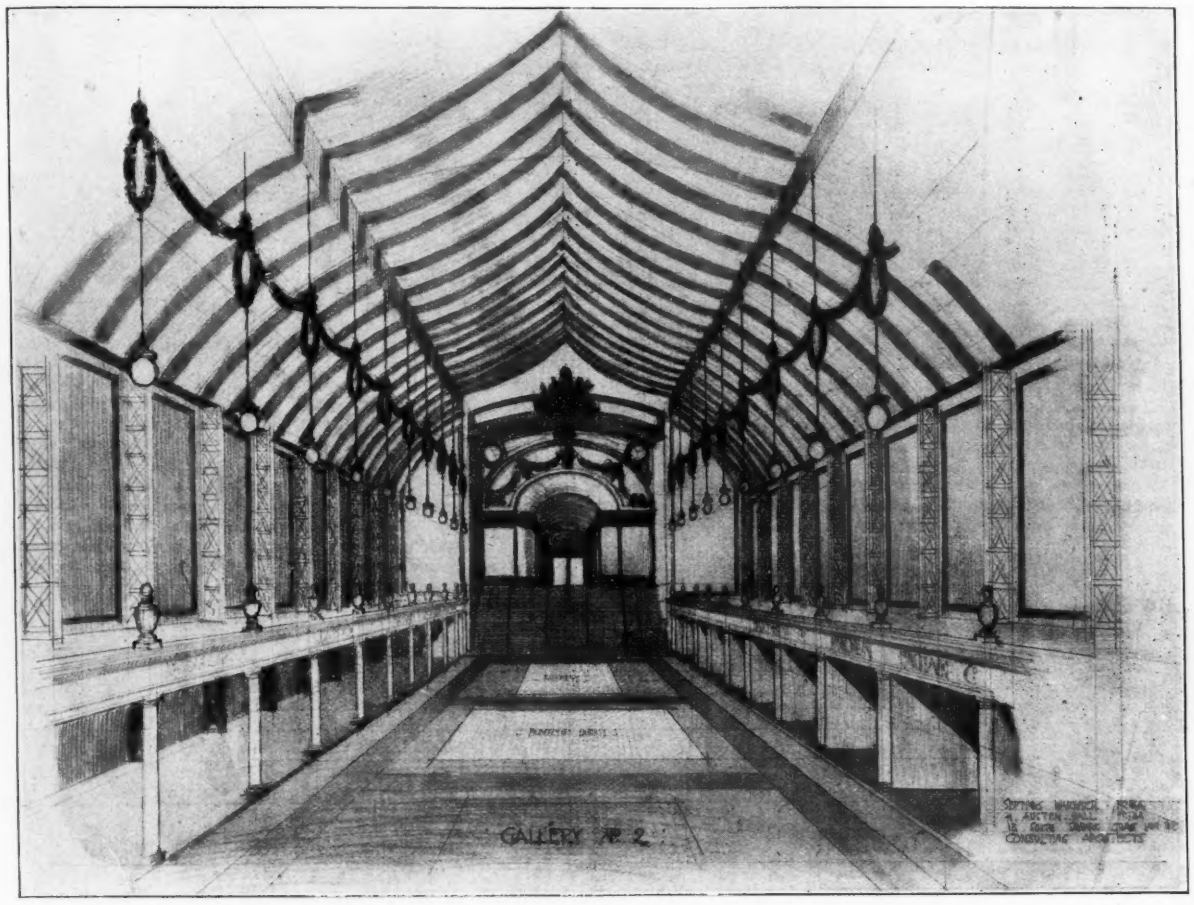
Principle of Co-operation.—It will be remembered that the primary idea of the scheme as originally enunciated was a co-operative exhibition on a large scale and on altogether original lines, designed to demonstrate to the public in a practical and attractive manner the uses and applications of gas for all domestic and commercial purposes, while at the same time doing away entirely with the competitive element which is usually so prevalent at exhibitions, to the annoyance and confusion of visitors. The ideal as set forth in the preliminary prospectus was considered by many to be almost impossible of attainment; but, thanks to the magnificent spirit of co-operation displayed by all sections of the gas industry—and especially to the manufacturers of gas apparatus and plant who constitute the Society of British Gas Industries—the success so far achieved has exceeded all expectations, for it has been possible to arrange that the co-operative principle shall apply, not only to that side of the exhibition which will appeal to the general public as users of gas, but also to those exhibits which are only of interest to the gas engineer and technical expert. It was borne in upon the Executive Committee as they discussed the detailed arrangements that the exhibition would gain much in interest, to both the public and to gas administrators and officials, if the exhibits intended to illustrate the manufacture, distribution, testing, and measurement of gas were co-ordinated in the order of the processes through which gas passes before it is sold, and were, as far as practicable, confined to models, plans, drawings, and photographs, with due acknowledgment of their source. This scheme would do away entirely with the necessity of makers supplying a staff to be in constant attendance at their stands, and would strictly define beforehand the expense of each exhibitor. The Chairmen of the various sections of the Society of British Gas Industries, upon being consulted, heartily approved of, and readily agreed to, the proposals made, and arrangements are accordingly being pushed forward on the lines indicated. This most satisfactory result has only been attained by the sinking of legitimate trade rivalry in the interest of the industry as a whole, and can only be thoroughly carried out upon the receipt of generous subscriptions to the exhibition funds by gas undertakings and manufacturers alike.

Estimated Cost of the Exhibition.—It is anticipated that, in order to carry out the undertaking in a manner worthy of the occasion, a sum of at least £25,000 will be required, which it is hoped will be provided in equal proportions by gas undertakings and plant and apparatus manufacturers. Of this amount, roughly £4000 still remains to be contributed by gas undertakings; the members of the Society of British Gas Industries having already practically guaranteed their moiety.

General Plan of the Exhibition.—The Executive Committee have appointed as Consulting Architects, Messrs. Septimus Warwick and H. Austen Hall, two able and enterprising young men, who have already gained distinction as the Architects for the Lambeth Town Hall, the Holborn Town Hall, and other important buildings. Considerable progress has been made with the preparatory work of planning out the exhibition, and the Committee are satisfied that the Architects' plans, when completed, will be of a highly satisfactory character. Some idea of the general arrangement of the exhibition will be conveyed by the plans which will be laid before the Committee.

Exhibitors' Club.—For the special convenience of exhibitors and visitors, it has been decided to provide an exhibitors' club, eligible for all who take part in the co-operative scheme, and for visitors by invitation of the members.

Catering.—Arrangements of a satisfactory character have been made



with Messrs. J. Lyons and Co., Limited, whereby the catering will be carried on under the control of the Committee at reasonable charges, to be fixed by the Committee.

PROGRAMME OF EVENTS.

The following is a preliminary list of the events and functions which it is suggested should be included in the exhibition programme; and it is proposed to issue invitations to Institutions abroad at an early date, in the hope of securing a good attendance from all parts of the Empire, and also from other countries.

Opening Ceremony and Luncheon.

International Day.—Visit of representatives of American, Belgian, Dutch, French, German, and Italian Gas Engineering Societies.

Empire Day.—Visit of gas engineers and managers from the Overseas Dominions.

Conference of Medical and Sanitary Authorities.—To discuss the hygienic aspect of gas for lighting, heating, cooking, and ventilation.

Conference on Coal Smoke Abatement.—To discuss the use of gas for fuel in relation to the problem of the smoke nuisance.

Conference on Food and Cookery.—To consider means for increasing knowledge of economical and correct methods of preparing and cooking food, especially in relation to cooking in the working-man's home.

Conference (of Persons interested in Social and Economic Questions) on the Economics of the Home.—To discuss the use of gas in its relation to (*a*) the artisan's weekly budget; (*b*) the economics of housekeeping for the middle classes; (*c*) the dearth of domestic servants; and (*d*) the furnishing and equipment of the home.

Conference of Educational Authorities.—To discuss the lighting, heating, and ventilation of schools; the physical and mental disadvantages of unscientific illumination; the teaching of cooking in schools; the arrangement and equipment of cookery and housewifery centres, &c.

Conference of Manufacturers.—To discuss the lighting, heating, and ventilation of factories and workshops, offices, and other places of business; the economic value of adequate illumination; the use of gas as a fuel for industrial purposes; the use of gas for power; cooking for employees, &c.

Conference of Chambers of Commerce.—To discuss the relations of capital and labour; methods for ensuring the welfare of employees; the apprenticeship system; technical and commercial education for workmen and staff; the relation of science and industry.

Conference on the Science of Illumination.—To discuss the principles of scientific illumination in their relation to the use of gas for lighting.

Visits of the following Associations.—Southern Association of Gas Managers; Manchester and District Institution of Gas Engineers; Midland Association of Gas Engineers and Managers; Wales and Monmouthshire District Institution of Gas Engineers and Managers; Eastern Counties Gas Managers' Association; North of England Gas Managers' Association; Irish Association of Gas Managers; North British Association of Gas Managers; Junior Associations.

Annual Meeting and Conference of the British Commercial Gas Association.—To be attended by representatives from the National Commercial Gas Association of America.

Closing Ceremony and Dinner.

SUBSIDIARY COMMITTEES.

In order that the whole scheme of the exhibition and its attendant functions may be carried out in an effective and thorough manner, the appointment of several Subsidiary Committees, as enumerated and defined below, is recommended, so that the mass of detailed work which is necessarily involved in an undertaking of such magnitude may be distributed, and thus, if possible, prevent undue pressure in any direction.

A large number of gentlemen (assisted in some cases by ladies) possessing special knowledge of the subjects concerned, have been invited, and the great majority have consented to serve on these Sub-Committees. The carrying out of the detailed duties which will devolve upon these Committees will aid materially in securing the success of the exhibition, with a consequent increase in the consumption of gas in all parts of the country, and the demand for appliances for its production, distribution, and consumption.

For the Executive Committee,

F. W. GOODENOUGH, *Chairman.*
H. M. THORNTON, *Vice-Chairman.*

LIST OF SUGGESTED SUBSIDIARY COMMITTEES.

1.—*Finance Committee.*—To account for receipts, consider and approve estimates, authorize all expenditure, pass accounts for payment, and prepare and submit accounts and balance-sheets. To determine prices to be charged for space and positions.

2.—*Preliminary Plans Committee.*—To prepare and submit detailed plans for arrangement of the exhibition.

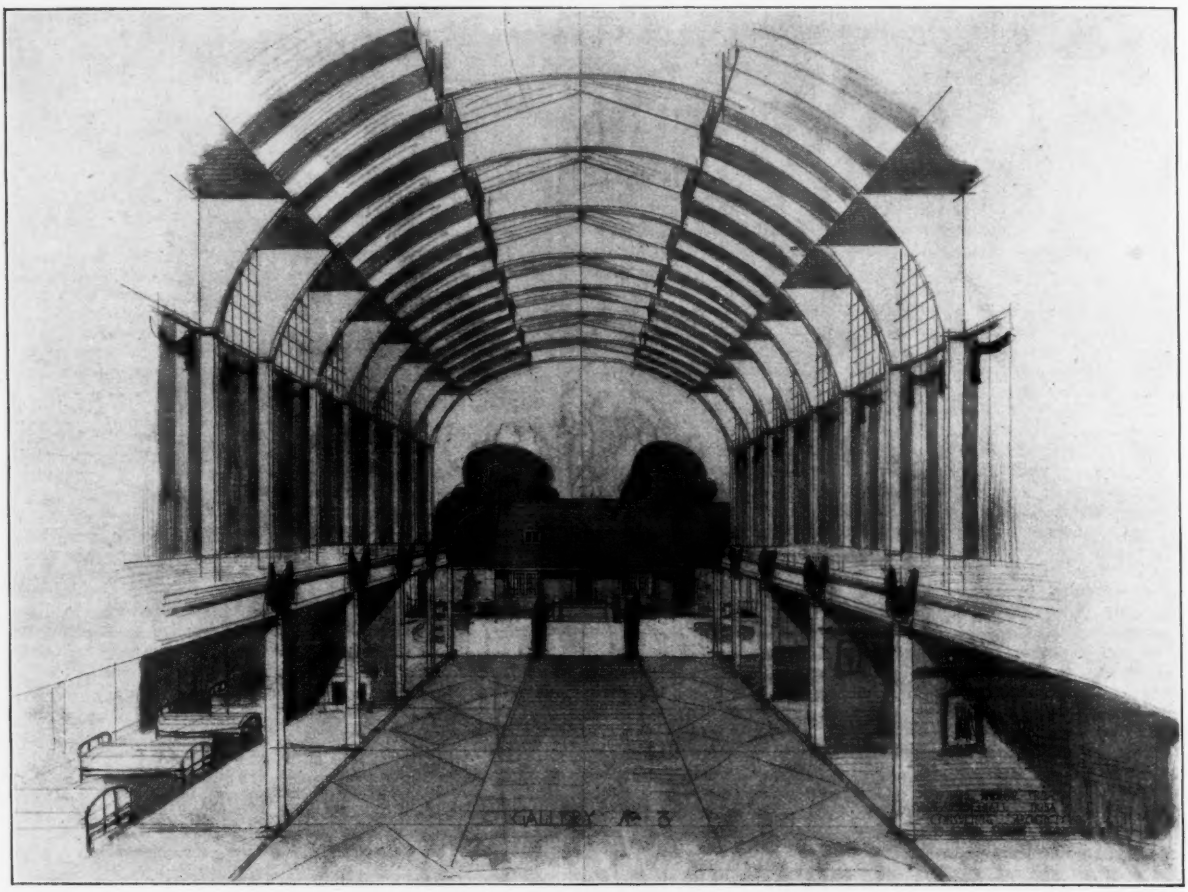
3.—*Allotment of Space and Position Committee.*—To determine the relative value of positions in co-operative exhibit, and to allot size of space and number of positions to exhibitors, within and without the co-operative exhibit.

4.—*Furnishing, Equipment, and Ventilation Committee.*—To design the furnishing and decoration of, and arrange the entire gas equipment in, the co-operative exhibit; to arrange for the general furnishing and decoration of the halls, lecture-rooms, committee-rooms, restaurant, &c.; to supervise the design and arrangement of independent exhibits; and to plan the general lighting and ventilation of the halls.

5.—*Publicity Committee.*—To superintend all arrangements for the advertising of the exhibition before and during the course. To control the expenditure of the amount allocated for this purpose by the Executive Committee; payment of all accounts being subject to the Finance Committee.

6.—*Editorial and Literature Committee.*—To superintend the furnishing of suitable editorial matter to the Press before and during the course of the exhibition, and the securing of adequate reports of the exhibition and its attendant functions, lectures, &c. To arrange for suitable advertising literature to be available for distribution to the public. To consider and approve all literature proposed to be distributed by exhibitors. To make recommendations to the Reception Committee as to Press invitations.

7.—*Travelling and Hotel Facilities.*—To negotiate with the railway companies for the provision of special facilities for the cheap conveyance of visitors from the Provinces and abroad; and to collect and compile for the benefit of such visitors information as to (1) such



railway facilities, (2) transit arrangements in and around London, and (3) hotel, lodging, and boarding-house accommodation (including details as to charges, &c.).

8.—*Advisory Staff.*—To select, engage, instruct, and supervise the necessary attendants for the co-operative exhibit; to make all arrangements (where necessary) for their accommodation in London; to arrange for their attendance, feeding, and convenience at the exhibition, including the preparation of detailed tables of hours and duties.

9.—*Reception.*—To make all arrangements for the reception, accommodation and comfort of all distinguished visitors and guests; to arrange for the invitation of chairmen and distinguished visitors to ceremonies, banquets, conferences, lectures, &c., and to determine all questions of precedence thereat; to prepare and supervise the issue of all official invitation cards, &c.; to prepare and approve table plans, menus, and seating arrangements.

10.—*Cookery Competitions and Demonstrations.*—To make all arrangements for cookery competitions, lectures, and demonstrations, including the engagement of lecturers and demonstrators, and the purchase of provisions and utensils; to purchase and award prizes and certificates, subject to the necessary grant from the Finance Committee; to negotiate with schools and other institutions for the entry of competitors; to appoint judges and jurors; and to superintend the fitting-up of the demonstration-room.

11.—*Conference and Lecture Committee.*—To plan, prepare programmes for, make all arrangements respecting speakers and lecturers at, conferences (other than that of the British Commercial Gas Association) to be held during the exhibition, and to organize popular lectures at other times.

12.—*Science of Illumination Committee.*—To arrange for exhibits, illustrations, and lectures designed to educate the public (and those who advise the public) in the principles of scientific illumination by gas; and to assist the Equipment Committee in regard to the lighting arrangements of model schoolrooms. workshops, &c.

13.—*Entertainments Committee.*—To make all necessary arrangements for the provision of cinematograph displays, lantern displays of photographs, concerts, bands, and other musical entertainments.

14.—*Programme and Catalogue Committee.*—To arrange for the compilation, printing, and distribution of programmes, catalogues, and other printed matter required for the information of visitors.

15.—*Records Committee.*—To organize the securing and recording of information regarding the points in respect of which visitors desire further advice or particulars or display interest, with a view to advising promptly the undertaking in whose district the visitor resides or carries on business, and so ensure that the inquiry be promptly followed up.

16.—*Catering Committee.*—To superintend all arrangements for the provision of refreshments: (*a*) To the general public. (*b*) To guests. (*c*) To the staff.

17.—*Service and Complaints.*—To superintend all arrangements for general convenience of visitors and exhibitors, including: Regulation of traffic; postal, telegraphic, telephonic, and messenger services; lavatory, cloak-room, rest-room, and parcel office services; newspaper, stationery, and similar facilities.

18.—*Exhibitors' Club.*

Mr. F. W. GOODENOUGH, in submitting the report of the Committee, said there were one or two points to which he would like to refer. The President had alluded to the question as to whether the exhibition would benefit the gas industry outside London and its neighbourhood. It seemed to him that the reply to this had already been afforded by the number of undertakings that had already become subscribers to the fund—undertakings as far north as Aberdeen and as far south as the Channel Islands, in Ireland, and in the East of England. They would not have been likely to join the scheme if they had not been persuaded that the exhibition was going to give a national impetus to the sale of gas, and not merely a local one. One point making for the success of a national show was the widespread interest aroused by the inviting of many distinguished men and women all over the country to become patrons. The list of patrons already circulated proved that they were securing very general support for the exhibition; and since this list was printed, a considerable number of additional names had been received. They had in the list put before the Executive Committee that morning the names of many titled persons, and of a number of educational dignitaries. He might mention that among the latest names received was that of Mr. Lloyd George. Then there were a large number of representatives of Chambers of Commerce, medical officers of health, architects, mayors, and other municipal dignitaries, who had been added to the list; and this fact, taken in conjunction with the programme of events which was set out in the report (and which programme they hoped would materialize into really effective congresses and discussions by those who led public opinion on questions connected with the use of gas), would ensure that the exhibition would have a widespread influence on the sale of gas—which was the prime object for which the exhibition was being promoted. In regard to the question of cost and subscriptions, he would like to point out that every additional thousand pounds put into their hands to spend would be of more value than the last. There were all the standing charges which had to be met first; and after this had been done, each thousand pounds they could expend upon making the exhibition better known and increasing its attractions would bring a bigger harvest. He would therefore like to endorse the appeal the President had made for further support from gas undertakings. It was a matter of very great satisfaction to the Executive Committee to feel that the co-operative principle had been adopted throughout the exhibition; and he thought this meant that they would have a most interesting and unique exhibition to place before the public. It was stated in the report that, instead of the gas plant shown taking the form of a number of stands of the different manufacturers, unco-ordinated and presenting all the features of trade rivalry, there would be a space set apart for a co-ordinated exhibit of models, plans, drawings, and photographs illustrating different processes of gas making, and showing which of the firms who were supporting the exhibition supplied plant for these particular

purposes. Illustrations of installations which the firms had put in would be shown, together with any plans and drawings they might choose to furnish, with full acknowledgment of the names of the firms who were associated with this class of work. A gas engineer could thus go round the section, and find collected together up-to-date information by the makers of the particular plants he might be interested in. Where manufacturers were also able to supply any models of plant, there would be space in which these could be shown, in conjunction with plans, drawings, &c.

Mr. D. Milne Watson moved the adoption of the report; remarking that it was unnecessary for him to add to what had already been said. It would be seen from the report that the activities of the exhibition were numerous; and, indeed, it was hard to see in what direction they could be extended. When the programme had been carried through, the British public should be well informed on the use of gas in every possible way.

Mr. Fred. J. West, in seconding, said that to him, as a manufacturer, the exhibition seemed unique, inasmuch as this was the first occasion on which the makers of apparatus had combined in this way with the gas undertakings for an exhibition; and he believed the result of the combination would be a show such as they had never had before in the gas industry. The exhibition should also be unique, inasmuch as they hoped there would be a gathering such as had not been seen before in connection with the industry. The endeavour would be, by a gathering of practically all the Gas Associations, as well as of kindred organizations, to earmark the month that the exhibition would cover; and it was felt that if any manufacturers or any gas undertakings failed to share in providing the wherewithal to make the exhibition a success, they would never cease to regret it. The manufacturers had "come up to the scratch" with their promised subscription; and he thought that in subscribing equal amounts neither makers nor gas undertakings were asked to do more than their fair share. His own idea was that the exhibition would be a wonderful and huge success. It had been suggested that only the London District would benefit from the increased sale of gas that would thereby be engendered; but this was a very narrow-minded view. The far-reaching effects of the exhibition would be comparable to the far-reaching effects of the British Commercial Gas Association. He believed many undertakings far removed from the base of operations of this Association had benefited very much from its efforts; and the same thing would be experienced in the case of the exhibition. ["Hear, hear."]

Alderman F. S. Phillips, of Salford, who supported the resolution, said he had been struck by the remarks made as to the paucity of support from the gas undertakings. This was a very extraordinary state of affairs; and he ventured to suggest that a special effort should be made to remedy it, by sending out a circular signed by the representatives of gas undertakings present at this meeting inviting the co-operation of others. Times were changing for gas undertakings. Hitherto, perhaps, there had not been a feeling of unity. But this was past; and they were beginning to find that there really was a common interest, and they ought really to regard themselves as missionaries. He felt quite sure much could be done to reform or convert the 1500 undertakings that had not yet come into the scheme—that, with the aid of the 200 that had come in, some impression might be made on them, in the way he suggested. There was still a tremendous amount of ignorance existing in regard to gas; and it was the right thing to pay particular attention to medical officers of health and architects.

The President said he desired to express his great satisfaction that Alderman Phillips should have been so good as to make the comments he had. In regard to the proposal to illustrate the manufacture, distribution, testing, and measurement of gas, he could not think it possible that manufacturers would be content to show merely photographs, plans, and models. He was sure it would be a satisfaction to all of them to find that an up-to-date gasholder was not to be one of the exhibits [laughter]; but there were many pieces of plant which were thoroughly interesting to the general public (as well as to those who were concerned with gas manufacture), that might well find a place there. He referred specially to gas-engines, and things of this character.

The resolution was then unanimously carried; and the proceedings closed with a hearty vote of thanks to the President.

NEW GAS-WORKS IN FRANKFORT-ON-MAIN.

A description by Mr. William W. Drory of the new Schielestrasse Gas-Works, Frankfort-on-Main appeared in the "Journal für Gasbeleuchtung" for Feb. 22. The erection of these works, which take the place of the now disused Gutleutstrasse works, was one item of the contract made in 1910 between the local authorities and the new "Frankfort Company," which is an amalgamation of the old Company and the Imperial Continental Gas Association. The new works are well situated near the new harbour of the town on the Main, and with easy access to the railway. They have been built large enough not only to cope with the increased gas consumption, but also to replace the old Obermainstrasse works as well as the Gutleutstrasse works, so that now only the new ones and those in the Solmstrasse at the west end of the town will supply gas; the Obermainstrasse works being retained for gas storage, offices, &c.

The completed portion of the new works is for 125,000 cubic metres (4,412,000 cubic feet) daily production, and the arrangement is such that further plant of twice this capacity can be added later. With the exception of the retort-house and purifying plant, the buildings themselves are already large enough for this extension. The retort-house contains four settings of five 18-retort vertical furnaces each. To the retort-house are attached the stokers' quarters. The gas is taken by an overhead pipe through the water-tube coolers to the apparatus house. The latter is divided into a warm room and a cold room. The former contains the exhausters and tar and naphthalene washers, and in the cold room are the second coolers and the ammonia washers. The house is arranged for two main sets of apparatus, of 125,000 cubic metres capacity each, of which one is completed, with the needful reserve apparatus. The reserve set will be able to be worked in conjunction with either of the main sets, when these are both completed. The purifying plant is arranged to take 125,000 cubic metres daily, and consists of three raised boxes, which are emptied from underneath. The lids are lifted by means of the same crane as raises the purifying material. The station-meter and regulator house is built large enough to deal with any possible increases of gas production, and is so arranged that all new pipe connections can be made without disturbing the working. At present there is only one holder, of 100,000 cubic metres (about 3,530,000 cubic feet) capacity, standing in a flat-bottomed iron tank. Between the retort-house and the apparatus house are the power plant, the ammonia factory, and the water tower with pumping plant and overhead tank. The power plant includes boilers and two steam-driven dynamos. The exhaust steam is used for blowing into the retorts as well as for the evaporating machines in the ammonia factory. The ammonia is worked-up for sulphate. For separation of tar from ammoniacal liquor and for storing these products, overhead tanks have been erected—it being thought that they are easier to keep in good repair than the usual underground tanks. Except for the large main between the retort-house and the apparatus house, all pipes are laid underground.

The coal is stored in the open. The coal yard is crossed by a viaduct, which carries a movable grab-crane for removing coal from the store. From this crane, the coal is taken away in telpher trucks, which also serve for bringing coal to the store. That which comes by rail is mechanically tipped into a pit, whence it is raised by a bucket-elevator system, which takes two-and-a-half tons at a time. This can empty the coal at two stages, according to whether it is to pass through the breakers or be conveyed on the telpher way to the yard. The coke is removed from the retort house in De Brouwer troughs, and is shot into tipping trucks. The containers of these are raised two at a time by a crane, which runs on a bridge, and empties the coke either at the coke-handling plant or in the storing yard. If it is required to remove any from the latter, the coke-containing portions of the same trucks are brought up by the crane, and filled by hand. The bunkers for sorted coke are built-in with the bridge, and so can be moved up and down, and used wherever most convenient. The workmen's quarters are spacious and well lighted; they include mess rooms, dressing rooms, and a bath-room with sixty shower baths; special arrangements are also made for constant ventilation. The retort-house, boiler-house, workshops, workmen's quarters, and the yard are all lighted by high-pressure gas. The building of the works occupied just under two years.

English Gas-Fires in Germany.

A further communication on this subject appeared in the "Journal für Gasbeleuchtung" for March 8. Herr von L. Schlegelmilch, of Borbeck, in Essen, relates how he had introduced French gas-fires into his district. These fires, which are made on the same principle as the English ones, had been excellently received, he writes, especially by medical men, and he had sold several hundreds of them. He had found it advisable, however, to have a regular inspection made of those in use, and have small repairs attended to, which from time to time became necessary. But, when carefully handled, they needed very little attention. The author states that the only objection to the introduction of these foreign gas-fires into Germany is the additional cost on the market owing to freight and Customs duty. He also considers it would be an advantage if there were some means of regulating more nearly the number of burners to be used, as the consumer must now light either five or ten; there being no intermediate stage. He further dwells on the importance of the gas company keeping in sympathy with the consumers, instructing them in the use of the new system of gas heating, and helping to choose a design of fire in keeping with the nature and general decoration of the room in which it is to be installed.

The members of the Eastern and Western District Divisions of the Scottish Junior Gas Association will pay a joint visit next Saturday afternoon to the Stirling Gas-Works, which they will inspect under the guidance of the Engineer and Manager (Mr. J. MacRae Smith).

The employees at the Dewsbury Gas-Works have presented Mr. Fred. Scholefield with a silver rose-bowl and pair of vases, on his relinquishing his position as Assistant-Manager on obtaining the appointment of Manager and Secretary of the Drighlington and Gildersome Gas Company, as announced last week. Mr. Scholefield has been at the Dewsbury Gas-Works from a boy; and he will consequently be much missed by the employees.

SOCIETY OF BRITISH GAS INDUSTRIES.

There was a large gathering of the members of the Society of British Gas Industries last Thursday for the annual general meeting, at the Trocadero Restaurant, Piccadilly Circus, W. This was the final meeting of the presidential year of Sir CORBET WOODALL; and, after the business meeting of the members, quite a large number of gas engineers attended so as to hear Sir Corbet's address, take part in the subsequent entertainment, and add to the welcome to the new President of the Society (Professor Harold B. Dixon, Ph.D., F.R.S.). By invitation of the outgoing President, the members were first entertained at tea.

The Business Meeting.

Sir CORBET WOODALL having taken the chair,

The SECRETARY (Mr. A. L. Griffith) read the minutes of the last meeting; and they were confirmed.

REPORT AND ACCOUNTS.

The following report was submitted by the Central Council:

In presenting the seventh annual report to the members of the Society, your Council have much pleasure in stating that the Society's membership continues to increase satisfactorily, and that the objects for which it was formed are being realized.

It is a matter of much gratification to the Council, and they are quite sure to the Society also, to know of the honours which have been bestowed on the President and several of the Vice-Presidents of the Society. His Majesty the King has conferred a knighthood upon our President, Sir Corbet Woodall. The degree of Doctor of Science has been conferred both upon him and Mr. Thomas Newbigging by the University of Leeds; while our first President, Mr. Dugald Clerk, has been similarly honoured by the University of Manchester. Professor Arthur Smithells has been elected a member of the Council of the Royal Society; and Mr. Balfour Browne, K.C., Honorary Treasurer of the Middle Temple. The Council tender to the recipients of these well-earned honours the Society's hearty congratulations.

The Council have continued to take an active interest in the British Commercial Gas Association, to which the Society has given its hearty co-operation, and they compliment that Association on the success of its first conference held in Manchester in October last, at which many of our members were present, and took part in its deliberations. It is the earnest hope of the Council that those members who have not already subscribed to the British Commercial Gas Association through this Society will now see their way to do so. The advertising campaign which has been undertaken by the Association has already shown itself most successful, and will no doubt in the near future prove of immense benefit to the gas industry.

The scheme for the National Gas Exhibition, 1913, on the various Committees of which the Society is fully represented, is now well advanced; and the Council have pleasure in announcing that the amount which it was suggested the Society should raise towards the funds has been practically assured. Your Council take this opportunity of thanking the members for their cordial support. They anticipate that the exhibition will show a marked advance on the older methods of displaying the various uses to which gas can be adapted, and will illustrate in a novel and impressive fashion the great progress of the industry.

Further conferences have taken place between the manufacturers of fire-clay goods and gas engineers, on the testing of refractory materials; and standard specifications have since been published in book form by the Institution of Gas Engineers.

The Council gratefully acknowledge the valuable services rendered to the Society by Sir Corbet Woodall, J.P., D.Sc., M.Inst.C.E. During his presidency he has taken the keenest interest in its welfare, and they trust that as a Vice-President of the Society, an office which he has been pleased to accept, they may long continue to enjoy the benefit of his ripe experience and advice.

The Society is fortunate in having secured as its President for the coming year Professor Harold Baily Dixon, Ph.D., F.R.S., Professor of Chemistry at the Victoria University, Manchester.

The Council also express their sense of appreciation of the valuable papers read at the Society's meetings during the year by Mr. T. S. Clapham, on "Industrial Unrest: Causes and Remedies," and by Mr. G. H. Pearson-Perry on "Recent Developments in the Manufacture of Refractory Goods from Fire Clay," both of which papers led to very interesting discussions.

The Council tender their congratulations to the Institution of Gas Engineers on the attainment of their jubilee, and trust that their efforts in promoting the advancement of the industry will meet with continued success.

During the year the Council have had under their consideration many important subjects which it is impossible to embody or summarise in a short annual report; and they hope that their year's work may have been helpful in cementing the good feeling which exists between all sections of the industry.

THOS. S. CLAPHAM, Chairman of the Council.

Mr. THOMAS S. CLAPHAM (Chairman of the Central Council), in moving its adoption, said he should like to say how much he had appreciated the support the members of the Council had extended to him during his year of office. The Council, as the members knew, consisted of the Chairmen of the different sections; and it was only due to them to say that they had put in good attendance at the meetings. In doing this, and in supporting him, they had supported the cause they all had at heart. They had attended to their duties in magnificent style. There had been six meetings—two of them in the Provinces (one at Birmingham, and one at Manchester) and the others in London. Notwithstanding the great distances some of the members of the Council had to travel, and that there were no fees attached to the office to meet travelling expenses [laughter], they made no excuse to absent themselves; and this showed that they had their hearts in the work. The average attendance had been 13·57, out of a possible 18; and he was proud to be able to report this as an evidence of the interest of the Council. They had carried out well the responsibilities placed upon their shoulders, and to the credit of the Society. No meeting had been held at which there had been fewer than twelve members present. When they remembered how far some of them had to travel, and what busy men they were, it was to their credit; and he ought to report the fact to the general members. The Council's report, of course, was merely an abridged account of the work that had been done; and there was much detail that could not be recorded. He had now had the pleasure of serving on the Council for seven years—since, in fact, the Society was first formed, when they had great difficulty in getting anybody to serve. The spade work, he could now say, had been done; the members of the Society had increased wonderfully; and the Society was in a healthy state. Part of the time of the Council in the past had been taken up by organization, and by cultivating the good spirit which, they were happy to know, now existed between the members and the Institution of Gas Engineers. The work had been largely accomplished; and he hoped now, as he watched the progress of the Society from outside the Council, that he might see through the doors that had been opened so fully for those in this important industry a still broader flow of the spirit which they had all striven to cultivate.

Mr. SAMUEL CUTLER, JUN., seconded the motion, which was unanimously carried.

Mr. G. H. PEARSON PERRY proposed, and Mr. H. M. THORNTON (Hon. Treasurer) seconded, the adoption of the financial statement; and this was agreed to.

CENTRAL COUNCIL AND OFFICERS.

The SECRETARY announced the names of the Central Council [see list succeeding the election of officers.]

Mr. CLAPHAM proposed that Mr. W. D. Helps (the Vice-Chairman) be elected Chairman of the Central Council. Mr. Helps, he added, was one of the progressive members of the Council; and there had been no meeting that he had missed.

Mr. JAMES WILSON seconded the resolution. Although Mr. Helps was a resident in the city of Leeds, he did not think they could claim him as a Yorkshireman; but Mr. Clapham was one. Mr. Helps, however, had acclimatized himself to it as well as any Yorkshireman.

The PRESIDENT: That is another evidence of co-operative movement breaking down barriers, as pointed out in Mr. Clapham's speech. [Laughter.]

The motion was cordially passed.

Mr. W. D. HELPS thanked those present for unanimously electing him to the important position of Chairman of the Council of such an important Society. He was quite sure that, from the start of the Society, it had been a great success. He was also fully conscious of the fact that they had had in every case a chairman at high-water mark. It was his hope that, at the end of the twelve months, he would find that he had retained the confidence of the members the same as his predecessors in the chair had done. Personally, he should be satisfied if he could equally maintain the position, without aiming at exceeding what they had done. With great pleasure, he proposed that Mr. J. W. Broadhead be Vice-Chairman of the Council. He was one of the pioneers of the Society, and served on the Council many years when it was difficult to get anyone to fill the offices. Particularly during the last two or three years he had done yeoman service.

Mr. A. P. MAIN seconded the motion; and it was heartily carried.

Mr. BROADHEAD having thanked the members,

Mr. F. TEMPLER DEPREE moved the re-election of Mr. H. M. Thornton as Hon. Treasurer.

Mr. H. J. DONKIN seconded the motion; and it was unanimously passed.

Moved by Mr. J. WILLIAM GLOVER, and seconded by Mr. T. E. UPJOHN, Mr. Cyril G. Davis was re-elected Hon. Secretary—Mr. Glover remarking that a more popular selection could not be made.

Mr. H. JAMES YATES proposed that the retiring Chairman (Mr. T. S. Clapham) be appointed an Elective Member of the Council. He was sure the members would not wish to lose Mr. Clapham's services from their counsels, and that they would wish to take advantage of the new rules under which they could elect members who were not at the time Chairmen of sections to take positions on the Council.

Mr. THOMAS GLOVER (London) seconded the motion; and it was agreed to.

Moved by Mr. JOHN MACKAY and seconded by Mr. THOS. DUXBURY, Mr. Fred J. West was appointed an Elective Member of Council.

Proposed by Mr. T. V. MILES, seconded by Mr. J. ARMITAGE DRAKE, Mr. H. James Yates was also appointed an Elective Member.

With these appointments, the list of officers for the current year is as follows:

President:

Professor HAROLD BAILY DIXON, Ph.D., F.R.S.

Vice-Presidents:

DUGALD CLERK, D.Sc., F.R.S.
THOMAS NEWBIGGING, D.Sc., M.Inst.C.E.
J. H. BALFOUR BROWNE, K.C.
Professor ARTHUR SMITHELLS, F.R.S.
Sir CORBET WOODALL, D.Sc., M.Inst.C.E.
CHARLES CLARE.

Central Council:

Chairman	W. D. HELPS	
Vice-Chairman	J. W. BROADHEAD	
J. ARMITAGE DRAKE, J.P.	representing Section	I
PERCY F. HOLMES	" "	II
SAMUEL CUTLER, JUN.	" "	III
T. V. MILES	" "	IV
J. WILLIAM GLOVER	" "	V
A. P. MAIN	" "	VI
F. TEMPLER DEPREE	" "	VII
S. W. TAMPLIN	" "	VIII
H. N. BICKERTON	" "	IX
G. H. PEARSON PERRY	" "	X
B. B. WALLER	" "	XI
JOSEPH TAYLOR	" "	XII
FRED. J. WEST, H. JAMES YATES, THOMAS S. CLAPHAM	Elective Members	
CYRIL G. DAVIS, *Honorary Secretary*; H. M. THORNTON, *Honorary Treasurer*	*Ex-Officio* Members	

Secretary: ARTHUR L. GRIFFITH, 46, Queen Victoria Street, E.C.

THE NATIONAL GAS EXHIBITION.

The PRESIDENT announced that Mr. Holmes and Mr. West wished to make a few observations in regard to the approaching National Gas Exhibition.

Mr. PERCY F. HOLMES said he desired to make a few remarks regarding the co-operative heavy section of the National Gas Exhibition, which co-operative section was the result of a meeting held the previous week. Prior to that, it had been the idea of a number of manufacturers of heavy plant that they were to have a certain place allotted to them, in which they could individually exhibit their goods. As a result of the meeting, it was found that it would not be practicable or useful to have a great number of exhibitors of heavy plant. Therefore it was decided that the manufacturers of heavy plant should work in co-operation similarly to the lighting and heating sections. Notice of this was given to the Chairmen of the various heavy sections; and at the meeting the previous week, on their behalf, the proposition was accepted. This decision was included in the report upon the exhibition that had been circulated. The idea was that, instead of various manufacturers having individual stands, the makers of plant from elevating plant to gasholders should show their photographs and models in a combined section. These would all be grouped so that engineers visiting the exhibition would not have to look for (say) West's or Drake's retort-settings in different parts of the place. It would be much better to have orderly arrangement than to have individual and scattered displays as first suggested. Personally speaking, as a manufacturer of heavy plant, he did not see that it was absolutely necessary for them to show any plant, because they would benefit by the boom created by the lighting and heating sections, as the increase in gas consumption must result in more producing plant being required. Why he mentioned this was that Mr. Miles spoke at the last meeting of a number of the gas plant makers having subscribed through his section (which was one of the largest sections); and they had done so with the idea that they were going to have individual stands and offices. As Chairman of the combined heavy sections, he (Mr. Holmes) had received these subscriptions; and he mentioned the matter now so that, if any of the gentlemen who had subscribed on that understanding, and did not see their way to do so under the revised form, should have an opportunity of making objection, and getting further information regarding the proposal. Most of the manufacturers to whom he had spoken were quite content to look at the matter from the present standpoint.

Mr. FRED. J. WEST supplemented Mr. Holmes's remarks. He said that the idea that emanated from the Council at the early stage of this matter was certainly to the effect that those members of the Society who did not come under the co-operative exhibit of the lighting and heating sections should have separate stands. This was his own understanding of the position; and it was the idea he entertained before attending the meeting of the Executive Committee that morning. He had, however, changed over rapidly to the idea that a co-operative exhibit of the heavy plant would be much the best in the interests of the gas industry generally, as well as in the interests of the heavy goods firms composing the Society of British Gas Industries. In his opinion, there would have been serious objection to certain sections of their Society showing in a co-operative exhibit, while other sections were allowed separate stands; and there would have been a lot of competition to get the best stands. The general idea was that they should have a co-operative exhibit, and send their photographs and models, and have them arranged irrespective of firms. They had to sink their individuality for the common good. He thought the exhibition offered an opportunity for the members of the Society; and it was an opportunity they should all most heartily embrace. He was optimistic, and believed the exhibition would be one such as the gas industry had never dreamed of, and would be a great success.

The PRESIDENT said he should like to elicit from the members their views as to whether the change was one that was acceptable to them generally. He was surprised to find that the idea of co-operation among the heavy sections was to some members new. He thought from the first this was in contemplation, and that there was no limitation to the makers of small plant and apparatus only. It was perfectly delightful to find that the gentlemen who had spoken had so cordially accepted what they felt to be good—not for themselves individually, but for the general good of the whole. Above all things let them be united—heartily united—and clearly appreciate what it was they were entering upon; so that there might be no difficulty or disagreement afterwards. His own feeling that morning when he read the report was one of disappointment that there appeared to be a disposition to limit the exhibition of plant to photographs, drawings, and models. He hoped sincerely, if they were to be reduced to this, that the exhibits would be most thorough, and of the best possible character that could be got up. Especially he hoped the models would be working ones, thoroughly and completely finished. Some little time ago he was in the works of a German firm of manufacturers, and he was taken to see their model room. He did not like to back up things Continental against things British. There was a great deal to be said about things British when placed in the first rank. But he had never in his life seen anything at all approaching the beauty and perfectness of these models. They were chiefly to do with conveying. If anybody wanted to take a lesson as to how models should be prepared, he would give him the name of the firm, and recommend him to call and see the collection. Let them have by all means at the exhibition working models, so that the method of manufacture was clearly understood of the uninstructed. Some of the visitors would take more interest in the manufacturing than in the distributing side; and he, for one, did not want that side to occupy in any sense a position inferior to the other.

Mr. F. V. MILES said it was quite true that at the commencement of these negotiations the members of Section IV. were given to understand that a separate stand and office would be available for all those who subscribed over a given amount. But, unfortunately, the point was not perhaps made quite as clear as it might have been, inasmuch as it was not then definitely settled whether each firm should have a separate stand and office. He thought, however, on consideration, it would be seen that it was almost impossible for each subscriber to have a separate office, with separate telephonic communication. This would mean hundreds of offices and telephones. He understood that the alteration was a very simple one. It meant that, instead of each subscriber having a separate office, there would perhaps be a few dozen, one of which would be available for each subscribing firm at a certain time, according to arrangement. He believed that it was also the intention of the Committee to provide a club. He was sure the Committee were looking after the welfare of the subscribers. He was pleased to learn that the whole of the subscribers had readily fallen in with the altered scheme. They must agree with what their learned President had said, that it was not the intention, even at the start, to provide stands for every one of the sections without providing similar convenience for the whole of the other sections. It would not have been fair. He hoped, with this slight alteration, he would not have any member of Section IV. coming to him and asking for the return of his subscription.

Mr. SAMUEL CUTLER, SEN., remarked, as one of the members of Section IV., it was his idea that they were to have individual location, where photographs and models could be shown. He quite agreed with the inconvenience of this; and, on behalf of his firm, favoured the proposition now made.

Mr. F. W. GOODENOUGH, invited by the President, said the change made having been accepted by Mr. Holmes and Mr. West, and having been so cordially endorsed by the meeting, there was really nothing further for him to say except to express, as Chairman of the Executive Committee, his hearty appreciation of the extraordinary spirit of co-operation that had prevailed throughout the meetings of the Executive and Organizing Committees. He had a high opinion of the members of the Society of British Gas Industries before the exhibition was mooted. If he might say so, his opinion had mounted up steadily with every Committee meeting. He thought that the meeting they had that morning, and the one that afternoon, augured extremely well for the health and success of the exhibition.

The PRESIDENT remarked that he should like to say the discussion had been to him a very great pleasure, because it was an admirable tribute to the work the Society had been doing during the six or seven years it had been in existence. He should think that five years ago it would hardly have been imagined that a body of men, so widely divided by space and interests, could have been associated as they were to-day in the matter of this approaching exhibition. The seed already sown by the British Commercial Gas Association last year was bearing good fruit. That the foundation of the Society had been well-laid, there was

evidence; and he trusted that it would go on the same lines, increasing in solidarity and harmony.

The PRESIDENT then delivered the following address on

RELATIONS OF GAS UNDERTAKINGS AND TRADING ENTERPRISE, AND OTHER TOPICS.

In expressing my appreciation of the honour done me by your electing me to this position, which has been occupied by so distinguished a line of men, I am fortified by the reflection that circumstances have conspired to conquer whatever reluctance I might otherwise have felt towards accepting the compliment. I esteem it, on the contrary, peculiarly fitting that one who has been called to preside over the Institution of Gas Engineers—an organization representing the engineering and the executive forces of the great national industry of gas manufacture and supply—in this the Jubilee Year of its existence, should also hold the corresponding office in the allied organization for the ancillary industries.

I feel that there is right both in the distinction and in the unity thus illustrated in my person. For although the differing characters of the business and professional relations of the two organizations demand independent recognition, yet the major interest and purpose of both—namely, the welfare and progress of the gas industry itself—are the same. The common stake that we have in our concern in this particular group of the industrial affairs of our country predominates over the diversity of our individual methods of pursuing it for personal advantage.

It is no mean calling that we follow. The national issues of the gas industry are wholly beneficial, and in a high degree subserve the advance of the community along economical ways, leading to improved conditions of social life. I am struck, however, in surveying both divisions of my supporters from these olympian heights, with the difference in their working conditions.

GAS UNDERTAKINGS AND PARLIAMENTARY RESTRICTIONS.

Whereas gas manufacture and supply are carried on under the strictest statutory requirements, which are in the majority of cases rigorously enforced, and—greatest protection of all—the accounts of every undertaking are published in a form which discloses all their financial conditions with the utmost particularity and fullness, the businesses upon which the favourable or unfavourable state of these finances ultimately depends are as exempt from similar control as a street stall. I do not say this with the slightest intention of drawing an invidious comparison, but merely to direct attention to a condition of fact, the true bearings of which on the selling price of gas are not, I am persuaded, adequately appreciated by the general public.

On one side are collected the forces of Parliament, the common law, general and special Statutes, the Government Departments, and municipal action—all focussed upon the objects of keeping down the price of gas and ensuring the quality of its public and private service. The gas company is not only controlled and supervised in all its dealings with the public, and its very capital put up to auction, it cannot stretch an inch even for its own protection beyond its prescribed sphere and functions. Five-sixths or more of all its extra profits during good times are given to the consumers of gas, even when much of the money is derived from products of manufacture which the consumer never sees.

UNRESTRICTED PRIVATE ENTERPRISE.

On another side are ranged the formidable powers of private enterprise, out for gain simply. The collieries, upon which the industry relies for its raw material, are under no obligation to allow to gas undertakings the "most favoured nation" treatment. On the contrary, they can, and do, export all the gas coal they can sell and send away; using the very fact as reason for raising the price against the home consumer. Ships cannot be had to carry coal coastwise in British waters, because they are chartered for Continental ports. Therefore, "the law of supply and demand" comes into operation to raise freights against the British gas and other manufacturer. All this pressure originates in the dark. It is nobody's business what profit the colliery proprietor makes out of the necessities of his customers. His capital is not put up to auction, nor are his accounts published in an official or other form. What is the only safeguard for his fair dealing? Commercial competition—nothing else; and even this, under the circumstances of the day, is practically non-existent.

It was only last session that a well-concerted parliamentary attempt was made to tie the hands of the managers and administrators of gas undertakings in yet another respect, in order that the suppliers of chemicals might form associations against them with greater ease and security. If we permit our eyes to range over the world-wide field of commerce, we shall perceive everywhere the expedient of the combine, the ring, or the trust—call it what you will—over-riding more or less effectually and perniciously the course of trade. It matters not at all what politico-economical faith men in business profess upon the platform—whether they call themselves Free Traders or Protectionists—when their own pockets are threatened, they will fly like one man to the most direct means of defence, which, like a Romano-British fort, takes the form of a "ring."

There is much to be said in excuse of this course of action. "Self-preservation is the first law of Nature;" and it is perfectly true that commercial competition has a too-common issue in what is well named the "cut-throat" extreme—killing both the trade and the trader. Many a good branch of commerce has come to an end by reason of mad competition cutting prices until the trade is no longer worth carrying on. The insufficiency of competition pure and simple to draw its own "Plimsoll line" has thus been demonstrated over and over again in various kinds of business, including that of gas supply.

Yet there is ample evidence lying all round us to prove that a middle way exists. Selling prices are, in fact, regulated upon a reasonable basis in most of the dealings of every-day life; and there are tariff rates for an infinite number and variety of commodities and services, from fire policies to bread. If we seek to ascertain the difference between these common arrangements to secure a living profit from a trade, and the objectionable conspiracy called a "ring," it appears to consist in the openness of the one and the closeness of the other. Anybody who chooses can open a baker's shop, and either sell bread at the tariff price, or take the risk of "underselling" if the tariff is unreasonably high. Where a trade is combined in a ring, no competing outsider is permitted to live. Instead of his underselling the ring, they will cut prices until he is driven away, when they can recoup their temporary losses at leisure.

It is rather remarkable, that whereas in France the price of household bread is still fixed by municipal assize, this ancient expedient for securing reasonable dealings in the staff of life has long been dropped as unnecessary in the United Kingdom. I could find it in my heart to wish that the principle of these dealings in retail trade were better realized in the large transactions by which the gas industry is sustained. I cannot shut my eyes to the knowledge that the prices of coal, freights, and to some extent of other necessaries, are otherwise influenced. Here the buyer's necessity is made the vendor's opportunity. Up go prices on the smallest pretext. I think this might be a case for Government intervention—loath as I am to say so. I have already, in another place, declared myself in favour of an export tax on coal; and I stick to my guns in this matter. There may be other means to the same end. If statutory regulation is the secret of gas companies' fair reputation, possibly the principle might be extended with advantage.

RELATIONS OF BUYERS AND SELLERS.

There are other respects in which the internal relations of buyers and sellers in the gas industry are not all that they should or might be. The actual practice in regard to gas-works construction contracts is unsatisfactory. Apart from bricks and mortar, which are a local market, the more important subjects of such contracts are divisible into the two classes of distinct pieces of plant—gasholders, station meters, &c.—and general extensions and reconstructions. There is a wide margin in gasholder design; but any order for such plant can be satisfactorily filled by a number of makers. The conditions therefore invite combination. There are no underbidders for such contracts. It is unnecessary to describe in detail what in all probability happens in the circumstances. I am not sure but that the most prudent course for large buyers preparing their own designs and able closely to estimate cost is to stick to a particular firm whose work and dealings have been found satisfactory, and so avoid the trouble, the cost, and the farce of "competitive" tendering.

With regard to the order of structural jobs—into which the factor of selection not only enters, but constitutes the preponderant element—quite a different policy is indicated. Here we find ourselves upon debatable ground, where chaos has existed for some considerable time. Take the common example of an occasion for the reconstruction of the carbonizing system of a respectable sized works—a job representing (say) an expenditure of between £12,000 and £20,000. Whether regard be had to the initial outlay, or the working results to be expected, such an undertaking calls for prudent handling. It is no longer a matter of building a simple retort-house, and fitting it with a certain number of plain retort-settings stoked by hand. Therefore, the works manager and resident engineer, who is quite competent to deal with problems within his own range of experience, is apt to feel in need of guidance in face of this emergency.

Accordingly, as one of my most esteemed predecessors in this chair, Mr. Thomas Newbigging, has pointed out, he falls into the way of inviting plans, specifications, and tenders from several firms of contractors who are known to have experience in the business. This means a gratuitous multiplication of expense, which, in the majority of all such cases, is thrown away. This style of competition is not often recompensed by any allowance for the cost of preparing the designs and specifications, which, I agree with Mr. Newbigging, ought to be made. The works engineer plays the part of assessor, which is by no means an easy task—indeed, so far as his own pains and ultimate responsibility are involved, he might as well do the work himself. Doubtless the competing tenderers are all competent to perform their own proper part; but the selection of the most suitable design still remains the gravest of an engineer's cares.

In these circumstances, there is room for the exercise of the consultant's wider range of knowledge. The day is past when the works manager was more of the grade and capacity now held to be fitting in a good foreman. An engineer he usually is by training and accomplishment; and it is no reflection upon him that he is not familiar with the resources of the latest structural technique—nor, it may be, with the true standing of every contractor. Of late years our industry has been troubled with more

than one example of advertisement masquerading as constructive capability. Getting into the hands of such impostors is much easier than getting out again; and a law-suit may easily prove more expensive than the best advice taken beforehand.

The only real assurance of obtaining value for money is in knowing exactly what one wants. For this reason a proper bill of quantities is indispensable to the procuring of close constructional tendering; and this, again, cannot be had in the absence of complete drawings.

STANDARD CONDITIONS OF CONTRACTS.

I have recently had to deal with the working out of the terms of standard conditions of contracts as between members of the Institution of Gas Engineers and of this Association. This is a development of mutual relations which counts for much, although it would be wrong to expect that any such agreed clauses can be depended upon in all cases to harmonize the opposing views of the parties. Engineers and contractors are but men, and have the defects of human nature. Probably it would be the ideal way to prepare for the smooth carrying out of big works if the engineers had some experience of contracting, and the contractor possessed the aptitudes of a born engineer. Two very great men in their profession and calling who have not long passed away—the late Mr. James Mansergh, and Sir William Arrol—were shining exemplars of this combination; and the works they wrought are their proper monuments.

Contractors for and suppliers of gas-works' stores, apparatus, and appliances have good reason for gratitude towards the founders of this Society, which has done, and is doing, so much to help its members to give the lie to the ancient saying that "two of a trade did never agree." It can only effect this good object by establishing a sufficiently high standard of public opinion within its membership.

There is an honour of the trader which is as necessary to the welfare of the commonwealth as the honour of the statesman, the justice, or the soldier. It is the proper function of such societies as this to set the seal of common consent upon the best realization of this honourable rule. Honour, however, is something more than honesty, although built upon it. It forbids a man to take an unfair advantage of another—whether by underhand means, or by decrying his goods, filching away his connection, or other courses which would not be openly acknowledged as "cricket" in this assembly. Like lawyers at the bar, competing traders can learn to "strive mightily, but eat and drink as friends." It is another long step along the same road that both traders and their largest customers are found together in the British Commercial Gas Association. The successful formation and operations of of this Association are, to an old gas man like myself, one of the wonders of the age. It is the turning over of a new leaf in the progressive record of gas industry; and I am sure we must all be pleased to see so notable a list of representative names upon the title page.

THE BRITISH COMMERCIAL GAS ASSOCIATION.

I must here interpose a request, which I trust will be taken in good part. It is that the Council of this Association will give further consideration to the amount of support of the British Commercial Gas Association vouchsafed by manufacturers, with a view to its substantial increase for the current year and onward. The primary purpose of the British Commercial Gas Association is to increase the popularizing of gas; but in accomplishing this end it necessarily brings grist to the mills of many—indeed, the great majority of the gentlemen I see before me. You cannot burn gas without the lamps, burners, stoves, fires, and engines appropriate to the purpose; and the extra 2000 millions of cubic feet or so which represented the increased gas consumption of Greater London for the past year can be translated into big figures in all the raw materials and appliances, from coal to mantles. I do not attribute the whole of this new business to the propaganda of the British Commercial Gas Association; but a large proportion of it is certainly due to the activity of the spirit which made that Society possible. It is a great encouragement to persevere in well-doing; and I trust those whom I am addressing will see it in this light.

THE FORTHCOMING GAS EXHIBITION.

Another sign of the times upon which we can congratulate all parties concerned is the co-operative effort that is being put forward to make the forthcoming Jubilee Gas Exhibition worthy of the occasion, and of the cause it is intended to represent. This is no ordinary undertaking. There are, of course, exhibitions and exhibitions; but we expect to derive exceptional pleasure and profit from the one on which we are now engaged. We intend it to exemplify and improve upon the best that has ever been realized by the same name, while being free from the less desirable features of previous shows of the kind.

VALUE OF THE COMMERCIAL TRAVELLER.

I fail to see why the interest of trade should ever be imagined to demand any less self-respecting means of the most "intensive cultivation" than those which will be represented by our exhibition—that is, an honourable co-operation. Surely the day of less worthy ways of pushing business is past. I have said that a great change has come over the personality of gas management during recent years; and the same may be said of the nature of the work itself. Modern gas management touches the community in many more points than the old; and it hardly needed the Prevention of Corruption Act to change whatever was bad in the old relation of the buyer and the commercial representative. Where a gas manager used to see, confidentially perhaps, half-a-dozen commercial travellers a year, mostly old acquaintances, he, or his deputy buyers, now openly meets as many scores. It is unavoidable. The wit of man has not yet succeeded in devising any better plan for introducing goods to possible purchasers wholesale than the call of the persevering gentleman whose visit had best be endured patiently, if time is to be saved; for he is not to be shaken off in any other way.

I believe that men in business, as a rule, get the travellers they deserve. One hears tales of rudeness, not all on one side; and I am afraid that the race of "Jacks-in-office" will not die out in our time. I trust, notwithstanding, that in our industry the gentleman who calls for orders will generally find a gentleman willing to hear what he has to say. It is a humiliating discovery for any of us who flatters himself he has risen superior to vulgar prejudices, to catch himself displaying a different manner to different people; and I fear that his directors and the men who wait upon him would not always see the same gas manager, even if that manager were I.

Before leaving this topic of the relations between manufacturers and gas companies, I must remind those who engage in the business of supplying gas-works' stores that no sentiment of nationality, "use and wont," or anything else outside commercial considerations can be allowed to weigh with gas companies in regard to the bestowal of orders. We like to keep up old connections, if possible; but we must stand out for our right to buy in the cheapest market that commends itself to our unfettered discretion—as you all do. We cannot bow to any form of monopoly. You will remember how your former President, Sir George Livesey, broke down the tyranny which the mistaken policy of the British owners of the Welsbach patent sought to fasten upon our necks. I imagine that the policy in question has long been recognized as a blunder, and a restriction of trade, by the successors of those who adopted it. The lesson, however, needs rubbing in.

MULTIPLICATION OF PATTERNS AND PARTS.

Manufacturers of gas cookers and fires, it appears to me, are greatly mistaken in multiplying patterns and special parts, with the object of keeping the renewals trade in their own hands. Thus, if a gas company thinks fit to stock a certain form of apparatus, hundreds of special parts and accessories must be kept, found room for, and carried about by the maintenance men. The result is that buyers fight shy of the goods altogether. The trade ought to understand that the pressure upon gas companies to standardize, in opposition to the vexatious diversity of manufacturer's "novelties," is becoming irresistible. Already some of the largest buyers are meeting the difficulty in their own way, and others will follow suit.

REMUNERATION OF LABOUR—CO-PARTNERSHIP.

Speaking to an assembly of business men, I cannot refrain from saying things which touch the greatest problems of our national industrial present and future. There are, for instance, the complex problems of industrial remuneration, of national defence, and of education. All these are very open questions. In regard to none of them is it possible to repeat the old counsel to "rest and be thankful," in the complacent belief that "all is for the best, in the best of all possible worlds." It is the only possible world, certainly; and it is given into our hands, or rather we are born into it, to make the best of it. In respect to the remuneration of labour—of all grades, be it understood—it is hardly necessary to argue that the actual state of things is unsatisfactory. The wage system is apparently worn out, notwithstanding incessant patching; and the salary variety of it is in little better case.

The essence of the wage system is in its quality of being a part of the cost of production which the party who pays strives to keep down, while the party which receives is bent upon keeping up. Therefore, employers and employed are made to appear natural enemies; and their only common cause is war upon the customer, who pays for both. This, stripped to the bare bones, seems to be the principle of the modern Syndicalists; who remain the sole practical exponents of pure Trade Unionism carried to its logical extreme. Lest this should be thought an extravagant view, let us see what happens in the colliery industry. The newspapers at the end of last month or the beginning of this contained the following announcement:—

WAGES OF NORTHUMBERLAND MINERS.

> At a meeting at Newcastle-on-Tyne between representatives of the Northumberland Coalowners' Association and the Wages Board of the Miners' Association, it was decided that the miners' wages should be advanced as from the next pay by 3¾ per cent.—making them 42½ per cent. above the basis of 1879. Four advances were given last year—1¼ per cent. in Jannary, 3¾ per cent. in May, 2½ per cent. in August, and 3¾ per cent. in November.

Now, what does this mean? In the first place, it must be taken to represent the highest development of the wages system, by agreement between employers and employed to share the benefit of advanced prices. Both parties are quite happy and contented; and the third party, the buyer, does not count. It is unnecessary to speculate as to the proportion of the respective

shares taken by the coalowners and the miners; but if there is anything here beyond a combination directly opposed to the public interest in getting cheap coal, I should like to have it pointed out. If it is accepted that employers and employed are the only parties interested in their trade, it is Syndicalism—adulterated with a temporary infusion of private ownership.

This is a kind of alliance which cannot endure, because it is opposed to economic forces which have a way of gaining their object. It raises the reputation of coal-mining as a profitable enterprise to a point that must attract new comers into the field. It exhibits mining as a highly-paid occupation, which must also attract poorer labourers from all parts. If these men will only join the Union, they will have as much right as the older hands to share the profits of high prices while they are going. Meanwhile, the dearness of coal is enforcing economy of fuel upon the consumers, and thus the fabric of the inflated trade is undermined to its fall. Next "slump" there are more sellers to fight for a living, and more miners to strive against falling wages. Is it a pleasing picture? Does it come appreciably near finality?

On the other side, suppose that these coalowners and colliers were in real co-partnership, sharing profits. Instead of conspiring to keep coal dear, they would, I think, try how cheaply they could put it on the market, in order to do the greatest volume of trade, and thereby reduce the burden of standing charges. I will not labour the point. Enough to say that, as a convinced co-partner, I sincerely adopt the argument in favour of the principle so eloquently put before this Society by Sir George Livesey, in his address delivered from this chair in 1908.

I wish to add an observation that is perhaps specially pertinent at the present time. We know how easily a phrase slipped out by a popular politician or orator gets into circulation, and passes current, irrespective of its truth or falsity. All that is necessary is that it should "catch on." Now I think a strong protest must be entered against the off-hand condemnation of co-partnership in production on the score of its "coming from the employers," which is a cheap way of damning the principle favoured by those who for any reason are opposed to it. I have seen it in print how certain would-be leaders of working-class opinion have laid it down as a universal proposition, that the labourer never got anything without fighting for it himself. That is to say, no social or industrial reforms ever came from the higher social grades, including Parliament and the Government! Such a travesty of history ought not to be possible for any child who has passed through an elementary school. What of the Truck and Factory legislation; Workmen's Compensation; and now Insurance? Who agitated for these boons?

NATIONAL DEFENCE.

With regard to my second touchstone for employers—National Defence—a great deal of the difficulty experienced in working the Territorial system is due to the opposition of many employers, who will not grant their young men the necessary facilities for discharging that duty to their country which, for their part, the men are quite willing to render. The hardship on one employer who is patriotic enough to freely grant leave as compared with another in the same trade who refuses and saves the cost, is palpable; but public feeling will eventually pronounce itself emphatically in favour of the former. I hope that this reproach does not attach to any of the firms represented here; but if there are such, I would most earnestly, as a man of peace from my youth up, implore them to re-consider their attitude, for the need is great. As a mere business proposition, service in the Territorial force is good for men and for employers.

EDUCATION.

Finally, there is the ever-present problem of education. I am not going to keep you long while I air my views on this much-debated subject. It has many sides, and all incite sympathetic attention. I hope I shall not be misunderstood when I say that in my judgment the chief need of the general public is not more technical instruction, but more and broader general education. The former kind of teaching can never replace (though it should supplement) a good and reasonable apprenticeship system, which, I am glad to say, we have instituted with much promise at the Gaslight and Coke Company.

I am impressed with the evidences that surround us, exhibiting the weak side of the compulsory element of our education system as hitherto worked. The children seem to shed so soon the thin skin of "schooling" they must have acquired before going out into the world. Their acquaintance with the three R's is too slight to keep up under the unfavourable influences that gather round their working days and vacant evenings. This should be maintained and improved by clubs which are at the same time recreative associations and continuation schools. By this means much that is now thrown away when a child leaves school would become a permanent possession. There is mingled with the multitude, who can just read, a leaven of intellectualism which tends to create unrest, because it has discovered that the passing of examinations does not open a social heaven to the aspirant.

Therefore, what is wanted, I think, is better recreative and social education, helping all men and women to enjoy life in the social state which at the time they may occupy. Not choking ambition, but purifying it. The more minds are broadened the better work they will do, when it is realized that the proper end and aim of education is not to ensure what is called a rise in the world, nor, of necessity, increased power of earning money, but to procure greater happiness and efficiency in the performance of all the duties of life. Most of the real good things in the world are cheap enough, and comparatively few are to be bought with money.

At the conclusion of the address,

Mr. CLAPHAM proposed a hearty vote of thanks to the retiring President for his able address, for his valuable services during his year of office, and for his kind hospitality that day.

Mr. W. D. HELPS seconded the motion.

Professor DIXON, in putting the resolution, remarked that one fear he had (with which no doubt those present would sympathize) was that he would make a poor successor to Sir Corbet Woodall. Those who had listened to the address must have been (as he had himself been) struck with the many aspects of Sir Corbet. He seemed to him to have been an engineer, a chemist, a soldier, an educationalist, and, above all, he had treated the whole thing like a philosopher. He (the speaker) had seldom listened to an address which had given him more to go away to think about. He did not say for a moment that he agreed with every point; but perhaps he would do so on reading over the address—even the point about the export duty.

The motion was carried with applause.

The PRESIDENT said he could hardly tell the members what a relief it was to him to have finished the address. They knew that it was with reluctance he persuaded himself that it was his duty to accept the invitation so kindly given that he should take the presidency of the Society. He was quite satisfied now that it was not a mistake, and that, in the year of jubilee of the Institution of Gas Engineers, it was fitting and right that one should take part in a Society representing so much to the industry in the control of which he was proud to participate. His association with the Society had been one of constant pleasure. There had been a certain amount of work to do; but the Council had not left much of it to him. He had tried to do as well as he could. Closing his year of office, he could only say, not to the members particularly, but to the industry as a whole, that the formation of the Society had been a thoroughly good thing—potent for benefit all round.

THE NEW PRESIDENT.

The PRESIDENT said he believed it was said of Charles II. that nothing in his life became him like the ending of it. [Laughter.] He (Sir Corbet) felt that one of the pleasantest things upon which he could congratulate the Society was that, in laying down his office, it was to be taken up by a gentleman so fully competent to adorn it and to benefit it as Professor Harold Dixon. He would not attempt to speak of their new President's many merits; but he had pleasure in wishing him as pleasant and agreeable a year of office as had fallen to his own lot.

Professor DIXON, on taking the chair, said he was not going to give the members an address, but he wished to thank them for the unexpected honour that had come to him. Why, he did not know. But there was one sentence in Sir Corbet Woodall's address which emboldened him (the President). It was where he declared that even engineers, manufacturers, and contractors were but men. If this was so, he hoped they would bear with him. Apparently in the past year or two, the Society had, in their Presidents, sandwiched (so to speak) the theoretical person—the professor—between men of great practical accomplishments. Whether this was a good thing or not, he did not know. But he did feel this, that there was a great deal of curious talk about there being a difference between theory and practice. He hoped to disabuse their minds of that; and he hoped they would not look upon him, a theorist, as being in any sense contrary to practice. It was absolutely impossible for anything to be right in theory and wrong in practice. If it was wrong in practice, it might be the fault of the practitioner; and if it was right in practice, it was all right in theory. He thanked them heartily for the great honour they had done him.

THE ANNUAL DINNER.

The members subsequently dined together with the President (Professor Dixon) in the chair. To the right-hand side of the President were, among many others, Sir Corbet Woodall, and another past-President (Mr. Dugald Clerk). To his left-hand side were the Chairman and Vice-Chairman of the Council (respectively Mr. W. D. Helps and Mr. J. W. Broadhead). A little farther on was Mr. James W. Helps. The Institution, the District Associations, and the British Commercial Association were also well represented. In the vice-chairs were Mr. J. Armitage Drake, Mr. G. H. Pearson Perry, Mr. Joseph Taylor, Mr. J. W. Glover, and Mr. B. B. Waller. After an excellent dinner, there were only two toasts—"The King" and "Our Guests." The latter was proposed by Mr. W. D. Helps. He remarked that the Society very heartily and sincerely welcomed their visitors, as their presence assured them that the efforts of the Society had not been in vain in helping forward the co-operation of the two sections of the industry. Mr. John Young, in responding, spoke of the delight of the visitors in being there, and seeing the helpful work that the Society were doing for the industry, through the harmonious co-operation between them and the Institution of Gas Engineers and the British Commercial Gas Association.

In an adjoining room, the remainder of the evening was spent listening to a musical programme of first-rate order. The arrangements for this were in the hands of the Hon. Secretary (Mr. Cyril Davis); and, as usual, he admirably discharged his duties.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

Annual Meeting in London.

THE Annual Meeting of the Association was held last Thursday at the Hotel Cecil, Strand, W.C.; and at the conclusion of the business proceedings, the members dined together. There was a very good muster of members present to hear the Inaugural Address of the Incoming President (Mr. H. O. Carr, of Wandsworth). The Retiring President (Mr. B. R. Green, of Mitcham) was unfortunately absent owing to indisposition; and so, at the commencement of the meeting, the chair was taken by Mr. H. C. HEAD, of Winchester.

A NOTE OF REGRET.

Mr. HEAD said he very much regretted to inform them that Mr. Green, the Retiring President, was laid up. He did not think it was anything serious; but it was sufficient to make him very uncomfortable, and to render it impossible for him to get to the meeting. He felt sure the members would wish to express their sympathy with Mr. Green and their hopes of a speedy recovery; and he would ask the Secretary to do this. Next he had to offer an apology on his own behalf—for occupying the chair, a privilege which, in the absence of the President, belonged to the Vice-President. The Committee, however, thought it would be rather awkward for the President, as Vice-President, to ask the future President to take the chair; and so he (Mr. Head) had been requested to fill the gap for the moment.

REPORT OF THE COMMITTEE.

The thirty-eighth annual report of the Committee was next presented, and adopted, on the proposition of Mr. J. FISHER (Tottenham), seconded by Mr. W. D. CHILD (Romford), who said he desired to take the opportunity of congratulating the late President and the Committee on the splendid meeting that took place last May.

The report began with the usual short account of the proceedings of the Association during the twelve months, and then went on to state that nine members had been elected and four had resigned. The Association were unfortunate in losing Mr. C. F. Ruggles, of Leighton Buzzard; and his death was much regretted. The balance standing to the credit of the Association at the beginning of 1912 was £74 1s.; and the receipts amounted to £125 3s. The expenditure was £118 16s. 4d.; leaving a balance of £80 7s. 8d. to carry forward. Copies of the "Reports of Gas Associations" were presented to the members, at a cost of £45 11s.

The HON. SECRETARY (Mr. W. E. Price, of Hampton Wick) remarked that perhaps the only point in the report which was worthy of special attention was the financial one. The Association came into 1912 with a balance of £74, and they closed the year with a balance of £80; so that they were on the right side.

THE NEW PRESIDENT.

Mr. HEAD said he was going to vary the strict order of the *agenda*, and ask the new President to take the chair before the election of members. It was the privilege of the new members to be introduced to the President, and they did not want to be introduced to a substitute. He would at once call upon Mr. Carr to assume the responsibilities of the chair.

Mr. H. O. CARR (Wandsworth) then took the chair, and was received with hearty applause.

THANKS TO THE RETIRING PRESIDENT.

The PRESIDENT said his first pleasurable duty was to ask the members to pass a cordial vote of thanks to his predecessor, Mr. Green. They had heard how, unfortunately, Mr. Green could not be with them that day. He had spoken with him on the telephone, and had learned that he had sprained his back, and that his doctor had forbidden him to go out. He, however, said it would only be a matter of a few days before he was about again. They would be glad to hear this. Mr. Green had carried out the duties of his office during the past year in an admirable manner; and it had been a very successful year. He (the President) had had an opportunity lately, through the amalgamation that had recently taken place, of being in close touch with Mr. Green; and this close touch had shown him what an excellent engineer Mr. Green was. No doubt this was the opinion of all the members, for they had paid a pleasant visit to his works last year. With their thanks, they would offer him their best wishes for the future. Mr. Green asked him to convey his best thanks to the members for their many kindnesses to him during his year of office.

Mr. W. G. HEAD (London), in seconding the vote of thanks, which was heartily carried, endorsed the remarks of the President, that they much regretted Mr. Green's absence from the meeting, and hoped his recovery would be a speedy one.

The PRESIDENT said he had to thank the members for making him President. It was with a very deep sense of personal gratitude that he accepted the position. In order to follow in the proper course, he had but to remember his worthy predecessors; and he assured them that he would do his very best to uphold the traditions of the Association.

AN INVITATION TO WANDSWORTH.

The PRESIDENT (continuing) remarked that another pleasant duty he had to perform was to give the members a very cordial invitation to hold the spring meeting at the Wandsworth Gas-Works. His Chairman and the Directors would be delighted to see them there, and would give them a hearty welcome. It was proposed that they should visit the works, and then have lunch. Afterwards, he put it to the meeting that they might embark on a launch, and proceed in this instance perhaps down the river. On various other occasions they had gone up-river, and a great many of the members were very well acquainted with the upper reaches of the Thames; but he thought there would be many of the members who did not know so well what was termed the "business part" of the river. He could assure them that it abounded with interest on both banks. So he put forward the proposal that they should on this occasion make an excursion down-river, and probably they could proceed as far as Gravesend before they disembarked. About the middle of May, when the spring meeting was usually held, would be a suitable time in regard to tides.

Mr. J. W. AUCHTERLONIE (Cambridge) remarked that he had great pleasure in proposing that their next meeting be held at Wandsworth, as suggested by the President, and he further tendered, on behalf of the members, their warmest thanks to the Chairman, Directors, and Mr. Carr for the kind invitation.

Mr. A. E. BROADBERRY (Tottenham), seconding, said he knew what an anxiety it was to an incoming President to try to find a suitable programme of entertainment for the day of the visit to his works. He certainly thought Mr. Carr could not have hit upon anything better than the proposed trip down the river.

The motion having been carried,

Mr. CARR said he would convey the thanks of the members to his Chairman and Directors.

NEW MEMBERS.

The HON SECRETARY then handed in nominations for two new members, who were elected. They were Mr. Walter T. Hogg, of the Mitcham Gas-Works, who was formerly Assistant to Mr. Green, and has now been appointed Resident Engineer of the Mitcham works of the Wandsworth, Wimbledon, and Epsom District Gas Company; and Mr. Robert Wardell, of Ponder's End, the Resident Manager to the Enfield Gas Company.

DISTRICT REPRESENTATIVE ON THE INSTITUTION COUNCIL.

Mr. THOMAS GLOVER (Norwich) proposed that the President be elected as the representative of the Association on the Council of the Institution of Gas Engineers for the year. He remarked that it was the usual custom; and in this case they would not hesitate for a moment to follow it.

Mr. C. W. OFFORD (Enfield) seconded the proposition, and it was agreed to.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—It is my pleasant duty, as your President, to thank you most sincerely for having conferred so great an honour and compliment upon me. I feel the responsibility of the confidence you have placed in me. Nevertheless, I will endeavour to carry out the duties, and trust to gain your approval. To do so, I have but to remember and try to follow the example and precepts of my worthy predecessors in office.

This year is of special interest, firstly from the fact that it is the Jubilee year of our parent Institution—the Institution of Gas Engineers—to the support of which we all endeavour to give of our best, and, secondly, that a great honour has been conferred on our industry by the knighthood of the President of the Institution (Sir Corbet Woodall), who has been the recipient of very many congratulations from personal and professional friends, societies, and associations—our own Association being among the number. Again, there will also be the National Gas Exhibition, at Shepherd's Bush, at which our industry can once more show the public what a necessity gas nowadays really is.

We, as a body of engineers and managers, know that so-called monopoly as applied to our industry has ceased to exist, and practically without exception there is active competition in every branch of our sales—gaseous, liquid, and solid. It behoves us, therefore, to meet competition by producing at as cheap a rate as possible, so as to make them attractive to the purchasers.

"*Ne sutor ultra crepidam.*" On the established principle conveyed in the Latin proverb, "Let the shoemaker stick to his last," I purpose, rather than to range over this question in generalities, to deal with it from the illustration furnished by my own experience; and seeing that it is the custom for your President to invite members to view his works at the spring meeting, such a course may be expedient in view of the invitation I have already given you—reminding you that the works you will inspect, though the

most important, are now only a portion of the whole undertaking, and are allied with the works you saw last year under the presidency of Mr. B. R. Green.

The uses of gas are manifold, and grow rapidly if it be moderate in price. I have the good fortune to be allied with a Company who are able to meet this want; and I find it arises from certain features which I will deal with seriatim. The low price is the result of a consistent and continuous policy extending over four or five decades. During this long period, the capital expended has had most careful and prudent consideration, both from the point of economical engineering construction as well as from that of productive return; so that at the end of 1912 we find that the small sum of 6s. 7·72d. represents capital expended per 1000 cubic feet of gas sold. It is interesting to note also that the late Mitcham and Wimbledon Company joined the newly-amalgamated Companies with the low capital of 6s. 11½d. per 1000 cubic feet.

The area for the present and future works has been bought piecemeal, and to an extent consolidated into one area consisting of about 23 acres, of which the works occupy some 11 acres—thus giving ample room for extension. It all has open Thames frontage, with the result that there is now about one-fifth of a mile unbroken frontage on the river. The plant and buildings developed and converted from time to time on this area are efficient, but make no claim to ornateness or to such conformity of design as is possible with new works on a virgin site.

COAL STORAGE AND SPONTANEOUS COMBUSTION.

In view of economical production, a primary and most important consideration is that of the rapid and cheap service for transit and storage of coals. Thus to have gas-works situated on a river with a depth of water sufficient to float a fair-sized collier is of immense advantage; and this has enabled my Company to employ two steamers, of 1200 and 1500 tons capacity respectively—thus saving lighterage and a second discharge. A floating pontoon, provided with two powerful cranes, is used for discharging the coals into barges at the rate of about 170 tons an hour; thus enabling a vessel to be cleared in one tide. The loaded barges are themselves a convenient form of storage, and are unloaded into the coal-stores, as desired, by means of powerful steam travelling cranes and grabs.

Not only is such riverside position of immense advantage with regard to coals and residuals, but in many other ways which readily suggest themselves. What may be dwelt upon especially is the method of coal storage. The coals are shot into coal-breaking hoppers, and thence drop into gravity bucket conveyors; each bucket being provided with a pair of wheels, running on a dead-level rail, thereby requiring but little motive power. This has the additional advantage of being practically noiseless. The first conveyor of this type (60 tons an hour) was installed three years ago. It is about 400 feet long. The conveyor serves the larger retort-house, and is fed by means of a 10-ton crane with a 30-cwt. grab. The conveyor has worked without renewals except for a few wheels. The cost of all labour from barge into stores is, as near as possible, ⅛d. per ton.

The greatest feature of the scheme is that it is on the "tunnel system." This method is not unknown; but at the same time its peculiar advantages may not be known to all the members. The system consists of an endless chain of buckets filled at ground level with broken coal, and automatically tipped at any point desired in its transit over the top of the coal-store. On its return, it passes downwards and enters a tunnel underlying the entire length of the store. An advantage of very great importance is that spontaneous combustion can be prevented by withdrawing the coal from any area which shows signs of spontaneous combustion, by withdrawing a slide in the roof of the tunnel. The coal is placed in the gravity buckets by means of a travelling filler running on rails in the tunnel. By this means, a V-shaped depression, or, perhaps a better description, an inverted cone of space, is created in the coal-store. Any coals showing signs of being affected having by means of this circular route again been raised to the top of the store, are taken to the stoking machines or deposited on the top of cold coals.

It would seem that the mere disturbance of the coals has the effect of practically destroying any tendency to further spontaneous combustion, assisted probably by the cooling effect of the gravity buckets during re-transit. The conical-shaped hole in the coal-store is filled with fresh coals. This has the effect of further modifying any tendency for the surrounding coal to fire. It will be interesting for members to know that since the first gravity bucket conveyor was installed in January, 1910, we have never experienced a coal-store fire, although at times coals have been stored 30 feet deep. Just before this first installation, the whole store, containing about 4000 tons, was on fire by spontaneous combustion, and the entire contents had to be removed. No immunity, of course, is claimed from fires due to spontaneous combustion during the unfortunate coal strike last March, when coals were generally scarce and stocks depleted. But during this period, the system described was of very good service, for at a very reasonable cost the coals were trimmed from the back of the stores and transferred by way of the "tunnel system" to the back of the coal screens behind the De Brouwer stoking machines.

COAL TAXATION.

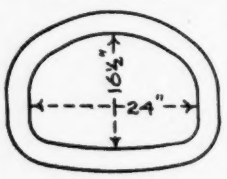
While on the subject of coals, some observations on the national output from our collieries, and its disposal, may be permissible with regard to the conservation of coals to this country. The subject has been one of controversy for many years. At the present time, however, it is of very great importance to home consumers, owing to the great scarcity of coal; and the time seems ripe for an effort to be made to stop the export of coal. The Board of Trade returns for 1911 have recently been published, and it is of interest and importance to study the figures; for we find that out of a total tonnage of 272 million tons of coals produced, no less than 87 millions were exported. This means that practically one ton in every three is exported—principally to Germany and France. It is curious to note, however, that Germany herself exports no less than 25 million tons. Of this, 95 per cent. is sent to the neighbouring Continental countries—probably because the German coalfields are nearer the confines of the German Empire, and that it is more convenient to send it to neighbouring countries, such as Austria, Hungary, France, and Belgium, than pay a greater rate for longer transit into her own Empire. It therefore suits Germany to purchase her deficiency in coal largely from the United Kingdom by a cheaper means of transit—that is to say, sea-borne coal.

It would be of great benefit to this country, and our industry in particular, if means could be found of, to a large extent, preventing this tremendous quantity leaving the country. In the absence of a subsidy to the coal owners, the only remedy appears to be taxation. What might be commendable would be to impose a small export tax to start with, gradually increasing year by year. This would give time for factories to be built at an increasing rate in this country to take advantage of the comparatively cheaper price as compared with the Continent. I do not say that coals would be much cheaper in this country, because we must bear in mind that with more factories the home consumption would be greater. Incidentally, the gas industry could reap advantage by supplying gaseous fuel, and solid fuel in the shape of coke, to the new factories. As the tax increased year by year, this would have the effect, in time, of largely decreasing the export of coal. What would be the effect on the Continent? Such a large stoppage of coal from the United Kingdom would send up the price of coals to such an extent on the Continent as to drive their manufacturers largely to this country, and tend to restore England to the former position she held in the world's trade. It cannot be said that there would be a permanent large difference between Continental prices of coals and English coal, because the effect of taxation in driving trade to England would be to lessen the number of factories on the Continent, and make coals there comparatively cheaper; but England would have secured her object by inducing trade to settle in this country.

It may be argued that it would deprive British shipping of a large quantity of coal carrying; but against this it may be said that there would be a far greater mass of merchandize to be carried away from this country, owing to the greater number of factories. It must also be borne in mind that any taxation of exported coal applies to the bunkering of foreign vessels, but not to British shipping. Nobody will deny that the greater British trade becomes, the greater should become the prosperity of all industries. The foregoing remarks are appropriate to the present time for another reason—that is to say, the effect the scarcity of coals has on the quality. There is an axiom, often quoted, "Dear coals—bad coals." It is true at the present time, when beggars can hardly be choosers; but it is surely a great want of foresight on the part of some collieries to allow so great a quantity of "bind" and inert material in our coal supplies. In spite of dear coals, owing to the good management of gas undertakings and the advance in residuals, very few companies or corporations are increasing the price of gas. Most are keeping steady, and in some instances prices are being actually reduced.

CARBONIZING.

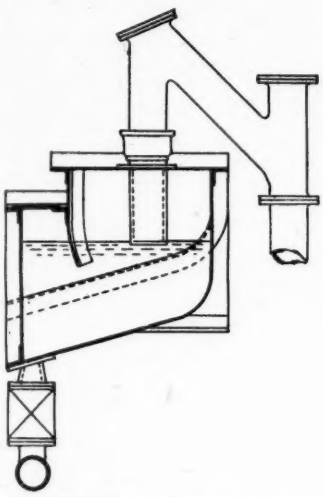
Retort-houses are always interesting. In the case of Wandsworth, there is nothing of unusual interest, except that the largest house has had a recent addition of six beds of ten 20 feet through retorts. In this recent extension, the retorts themselves are of a large size (24 in. by 16½ in.) and are shaped with a curved bottom; the sides being partly flat, as shown in the sketch. The special advantage of this form of retort is that it can be charged with a large quantity of coal—about 14 cwt.—by the De Brouwer charging machinery (the only type now at Wandsworth), which is carbonized in ten or twelve hours. The resultant coke is of a very much larger size than that obtained from our smaller retorts, which are 21 in. by 15 in. This is due not only to the larger size of the retorts, but also to the curved bottom. The invariable line one sees in the section of the coke as it breaks off on being pushed out—the last portion of the charge to harden in the process of being converted into coke—is lower than in the case of smaller retorts with flat bottoms. Hence the large lumps of coke. The curved bottom, moreover, aids the pushing out, as it seems to keep the coke stiffer, and the whole retort is left much cleaner than the flat-bottom retorts.



Section of Retort.

Another good feature is the form of hydraulic used. Many years ago, Mr. Harry S. Freeman introduced hydraulics dipping in the middle, at which point there was a draw-off cock for any thick tar, which was drawn off periodically. They served their purpose very well; but this was in the days prior to tar-towers. It was found, however, that on many occasions with a simple

dip in the middle, and working in conjunction with tar-towers, clots of tar were apt to lodge at the very bottom of the hydraulic—the crease formed at the bottom of the V being horizontal, and not assisting the tar to drain to the tar-towers. Unless dislodged frequently, these clots of tar hardened and enlarged. It was therefore necessary to alter the form of the bottom of the hydraulic so as to give the tar greater facility for automatically emptying itself. The bottoms of the new hydraulics were made with a fairly sharp slope in every direction to the tar-outlet in the centre, as shown on the accompanying sketch. This has been found to give great satisfaction—in fact, since the new beds have been at work (five to six months) there has not been the slightest trouble from tar lodging in any part of these new hydraulics. Should there be any trouble, however, from an unusually stiff lump or tarry or pitchy matter, or any foreign solid matter by some means getting introduced, there is a seal-box with cover plates, so that any unusual occurrence in the working of the hydraulic can be easily corrected.



Section of Hydraulic Main.

Although in other parts of this particular retort-house there is in many instances only a single pipe to each through retort (they were erected prior to the introduction of De Brouwer stoking machinery), it is preferable with this form of machinery to have a 6-inch ascension pipe at each mouthpiece. The new beds so fitted very rarely offend with regard to stopped ascension pipes. With regard to the older part of the retort-house referred to, in the first instance these beds, to the number of twenty-four, were only of six retorts each, with non-regenerative fires. They were capable of producing about 2¼ million cubic feet of gas per day. But, without disturbing the original arches, they were converted to regenerative beds of six retorts. The former Engineer (Mr. H. S. Freeman), having in mind the possibility of successful regeneration, had thoughtfully provided the necessary space and cellars for the future. The change to regenerative firing considerably reduced the fuel account, as might be expected. Later, when it was necessary to manufacture more gas for the growing demands of the district, and when the original arches were no longer useful, these beds of sixes were converted, a few at a time, to beds of tens—the remaining beds being at work. With the larger number of retorts in a setting, there was not room for two ascension pipes for each retort. The point, however, of the foregoing remarks is the fact that a retort-house making 2¼ million cubic feet a day was converted, in about four or five years, into a house making about 3¾ millions per day, without in any way enlarging the retort-house itself—thereby saving capital outlay.

The regenerative furnaces of the six beds of tens recently put to work show very economical results—in fact, 12½ per cent. of fuel. It was found by trial in the renewal of the old regenerator furnaces that, consistent with safety, the tiles forming the wall between the flue gases and the up-take of the secondary air on its journey to the nozzles at the burning point of the fuel gases, could be thinner. At the same time, it was possible to widen the furnaces. This wall, between the waste-flue gases and the flat secondary air-chamber, was reduced from 5 inches to 3 inches thick; thereby adding 4 inches to the width of the furnace. The greater amount of heat absorbed by the secondary air, due to the greater radiant heat of the thinner walls, was very marked. Instead of the separate tiles, a form of slotted box tiling is now used. This does not alter the system of absorption of waste heat or reduce the 3-inch wall, but gives greater stability to the structure of the furnace and precludes to a greater extent, by reason of the less number of joints, any short-circuiting between the secondary air-chamber and the waste gas-flue—a cause of frequent breakdown to many regenerator furnaces.

COKE-CONVEYING PLANT.

The coke-conveying system put into operation in January last for this retort-house may prove of interest. It serves 29 beds of ten retorts. It is of the well-known De Brouwer type; but owing to the position of the retort-house, and there not being any room to store coke at either end, the coke has to be stored in the coke-yard flanked on either side by a retort-house. The conveyor in front of the retort-beds is split up into three separate working parts, both for convenience in working and to lessen the strain as compared to one continuous conveyor. The coke from each separate conveyor is dropped into a cross conveyor under the retort-house floor. At the delivery end of each cross conveyor is a coke pit. Each pit is served with two coke skips, each holding 1½ tons; the coke falling on to a deflector plate and filling the skips alternately on each side of the cross conveyors.

Two powerful cranes on a gantry 20 feet high, and running parallel to the retort-house, haul up the skips of coke and deposit it about the middle of the coke yard. The coke is not dropped from the skips, but is quietly allowed to slide out of them; the bottoms being formed of two leaves, which are opened gradually by the crane driver when the skip is within about a foot of the top of the coke heap. A second winding drum is fitted to each crane. In hauling up, the chain which is attached to the leaves at the bottom of the coke-skip practically takes the whole weight. In emptying the skips, the chain attached to the top of the skips is made to take the whole weight; and so it follows that the weight of the coke contained in the skip forces open the bottom leaves and allows the coke to slide out.

To close the doors after the coke has been emptied, it is only necessary to once more transfer the weight of the skip to the chains attached to the bottom leaves of the skip. The skip is then swung round and dropped into the coke pit for replenishment.

PURIFICATION.

The disintegration of spent oxide material by means of an electrically driven disintegrator is of interest. No novelty is claimed for this method of pulverizing and aërating spent oxide, because in several instances they have been installed in gas-works; but the machine at Wandsworth is perhaps more powerful than at other works. The machine is capable of disintegrating 10 tons per hour. The material used for the most part is burnt oxide specially prepared, which is not only cheaper in the first instance, but, when properly prepared, is found to be very active. A purifier recently emptied showed a result of 38 per cent. of sulphur being turned out of the purifier for the first time. Air is passed into the purifiers for revivification *in situ*. A disadvantage, however, was found from the fact that, after having done its duty, burnt oxide cakes together in a solid mass, and when emptied in large lumps into the cellars beneath the purifiers, unless quickly pulverized, fires, owing to the large interstices between the lumps, and the active action of revivification setting in through the material containing a good percentage of sulphur.

The eight purifiers are each 40 feet by 36 feet by 8 feet deep, and contain 185 tons of material when spent. Such a mass of spent oxide can cause a great deal of trouble from firing. It became necessary, therefore, to find some quick means of pulverizing the spent oxide, and not only saving wages but preventing loss of sulphur by firing, and at the same time partially revivifying the material by driving air into it during pulverization. The disintegrator provides all these ready means; the material being uniformly disintegrated so as to easily pass 90 per cent. through a screen of ⅛-inch mesh.

Instead of, as formerly, ejecting the spent material through the bottom of the purifiers into the cellars, it is thrown into barrows on a stage level with the top of the purifiers, wheeled, and tipped into the mouth of the disintegrator. The latter pulverizes it and shoots it into a hopper with a sliding door. Hand-carts on the cellar level are wheeled under the hopper and filled by drawing the slide. The disintegrated oxide is wheeled away and tipped in a flat heap in order to further revivify. It is once turned over by hand before being again loaded into a purifier. This operation of turning over is easily performed, because a screen is unnecessary, nor are there any lumps to break, as formerly, with the back of the shovel. Consequently, in order to finish aërating the material, only a few labourers are required, so as not to hurry the process.

As a comparison with regard to the saving of labour, formerly a box of spent material cost about £80 to break up and aërate, and took between two and three weeks to perform. Now the whole cost is about £20; and the work is performed in four days. This releases men engaged on purification to do other useful work. Usually, the purifying gang is composed of handy men. As to the extra time a purifier will last owing to the better contact due to the greater surface of material offered to the gas to act upon, I am unable at present to tell you, as no purifier with disintegrated material has yet been taken off. Recently the stream of gas has been split in two; four purifiers being devoted to each stream. This will also materially lengthen the life of each purifier, and consequently cheapen the cost of purification.

MAINS—THE "DUPLEX" SYSTEM.

A system adopted several years ago for ordinary pressure mainlaying in the side streets of the Wandsworth area may be interesting. It may be termed the "duplex" system of street mainlaying. It is well known that the longer the service pipe the greater amount of trouble and attention it will cause. This fact led my Directors to consider the advisability of laying a main on each side of any new roads or streets, instead of the usual single pipe. Each main is laid as near as possible to the houses, thereby reducing the length of the service pipe. It is obvious, therefore, that the mains and services, being laid only under side pavements, escape the attention of the steam roller and heavy vehicular traffic, the amount of which is increasing year by year. There is therefore less opportunity for broken mains and their consequent dangers. The most important consideration is the reduction in the number of complaints due to defective supply.

Some statistics have been taken out to support this view, by comparing two streets of the same length, running parallel and within 70 yards of each other, and of entirely similar houses and class of consumer. One is served by a single 6-inch main, the other by the duplex system of maining, consisting of a 4-inch main

under each foot-path. It was found that the comparison with regard to consumers' complaints was exceedingly favourable to the duplex system, to the extent of a little over three to one. Moreover, the cost of the two 4-inch mains and services was slightly less than the one 6-inch main and services.

In adopting this system, the future was not left out of consideration with regard to the maintenance in the shape of paving and labour charges; for it must be borne in mind that should for some reason a service have to be relaid, the paving charges are very small, as in most cases of new roads the pavement nowadays is comprised of artificial stone slabs, which are easy of removal. Not only this, but as the pipes are only laid about 18 inches under the pavement, very little excavation is necessary to uncover the mains and services. It is a commendable system to the local authority, because the carriage paving is left undisturbed, and no unsightly results of trenching are apparent; nor are there any syphon boxes to be lowered or raised, because of the boxes being pressed down by the traffic, or the carriage way worn away and leaving them high above the road surface. The total length of side streets laid with duplex mains in the Wandsworth limits is 10 miles. Advantage is usually taken when new streets are formed of laying the mains in the paths before the houses are erected, as it not only saves paving costs in the first instance, but promotes the letting of the houses, especially where they are likely to be occupied by automatic consumers.

HIGH-PRESSURE LIGHTING.

In connection with the rivalry between the two illuminants, it may be interesting to mention what has taken place with regard to high-pressure gas lighting in Putney High Street, which, as an important thoroughfare composed of practically all shops in a short length of 700 yards, is the scene of keen contest. Prior to any installation of high-pressure gas, there was a shop frontage of about 480 yards, or about 58 per cent. of the whole, lighted by electricity. Since the high-pressure installation in 1910, and in spite of the electric lamps of the same candle power, and maintenance being quoted at exactly the same figures as high-pressure gas, 192 high-pressure lamps for outside shop lighting have been installed (representing 166,300 candle power), and 255 electric lamps have been displaced (representing a nominal candle power of 111,430). Of the total shop frontage at the present time, 71 per cent. is gas lighted, of which 54 per cent. is high pressure and 17 per cent. low pressure. The total consumption of the high-pressure gas-lamps per annum amounts to over 2½ million cubic feet, which, it must be admitted, is remarkable for only outside shop lighting in so short a distance as 700 yards. There are special reasons why the shops have a preference for high-pressure gas—not only because it has a more brilliant appearance, and the white light shows off goods in their true colours, but because there is a maintenance man always in attendance should there be any cause of complaint.

The question of whether cast-iron mains or solid-drawn steel tubes should be used for the distribution of high-pressure gas has been a subject of controversy. No trouble has, however, been found in using cast-iron in such a pipe-crowded thoroughfare as High Street, Putney; and one is inclined to think that piping of practically indefinite durability is the safer method. Cast iron has a longer proved life than steel for tubes, and is able to stand a greater amount of corrosion. Both systems have their own particular advantages; but the weight and greater durability are perhaps in favour of cast iron.

DAY CONSUMPTION.

It is interesting to observe the increasing consumption during the daylight hours—due principally to the extended use of gas-cookers, gas-fires, and other domestic apparatus needing gas. For convenience sake, I have taken 6 a.m. to 6 p.m. Although these hours do not quite tally with what may be strictly considered the average duration of daylight, yet it is near enough for the purpose. In 1907, the daylight consumption at Wandsworth was 47·2 per cent.; and in 1912, 53·5 per cent. of the total consumption—a difference in five years of 6·3 per cent. This is no doubt common experience; but it shows that the night consumption is now less than the day consumption.

One does not usually consider strikes as useful occurrences; but it must be conceded at the present time that the coal strike had a marked effect on the day consumption last year. It has evidently become apparent to the public that the gas industry is capable of looking after its own interests, even in the face of a coal strike; and rather than have the inconvenience and cost such a strike causes in the domestic household, it prefers to rely on gaseous fuel, the price of which does not increase.

GAS-FIRES.

There is no doubt that the modern gas-fire is improving from day to day. The general design and more pleasing appearance compared with gas-fires of a few years ago, together with the attractiveness of the columnular fuel, and the greater heating efficiency per cubic foot of gas consumed, have had a decided influence on the public. There is still room for improvement in the modern columnular fuel. Compared with the old ball fuel, the modern fuel seems to lack brightness. An opportunity has occurred at Wandsworth of comparing in the same room an old gas-fire with ball fuel with a modern fire and the new long fuel. The room had a fireplace at each end. There was, however, a very marked degree of brightness in the old stove as compared with the modern one. The lack of brightness in the modern fuel is a drawback, as the gas-flame is allowed to pass too easily through the interior of the fuel. As a remedy, there ought to be a sufficient number of horizontal spikes formed in the interior of the fuel to arrest the heat from the flame. In this manner, the modern fuel would obtain a brighter appearance, and probably give an even better efficiency. Mr. Charles Carpenter has brought out a form of fuel which seems to be suitable—resembling somewhat a skeleton cube or truncated pyramid shape. When placed horizontally in tiers over the flame of the stove, these fuels are likely to extract more heat than the present long fuel—there being no fretwork in front to arrest radiation.

Any attempt to standardize gas-fire fuel at the present time, as has been suggested, is premature. There are still improvements to be made. A well-known firm of gas-stove makers have recently evolved a gas-fire not requiring an extended flue pipe, which, by means of practical tests, has been shown to be capable of preventing any products of combustion being emitted into a room. This is quite true in many instances; and our thanks are due to the firm in question for the advancement they have made in improving the modern gas-fire. It does not by any means, however, prove by deduction that every other gas heating stove emits burnt gases into a room. To a great extent it depends on the natural draught of the chimney. The gas industry has not been blind in the past to its own interests; and it naturally follows that where there has been a tendency for fumes to be emitted into the room, a flue-pipe of sufficient calibre and length has been connected to the stove to ensure its efficiency in ventilation.

It is of great consequence, of course, to be able to use gas-fires requiring no extended flue pipe. But, as there are a great number of good gas-fires with years of life before them, it would not be sensible for gas undertakings to scrap every fire which has to use such a flue-pipe. The point is that the general public, on hearing of the qualities of the new gas-fire, may, by deduction, think that any gas-fire requiring a flue pipe as referred to above was unhealthy; so it behoves us to explain that such is not the case, and, if necessary, prove the contrary to them in their own homes. This is a matter which should be explained by the outdoor staff, and especially should the fitters be carefully instructed, as consumers naturally expect them to be able to explain such a matter when the stove is actually fixed.

AUTOMATIC CONSUMERS.

Automatic consumers and gas authorities mutually benefit in the supply of gas at a moderate price, as may be gathered from some comparisons made from a table recently prepared by Mr. Charles W. Braine with regard to automatic supply at Wandsworth. In the year 1904, when the price of gas was 3s. per 1000 cubic feet—2s. 2d., *plus* 10d.—the average consumption per installation was 17,600 cubic feet; whereas with gas supplied through automatic meters at 2s. 7d. per 1000 cubic feet—1s. 9d., *plus* 10d. —in 1912, the average consumption per slot installation had risen to 20,616 cubic feet. In other words, whereas in eight years the price of gas has been reduced 14 per cent., the average consumption per automatic installation has risen 17 per cent. Again, taking the years 1904 and 1912, the number of consumers has increased from 12,213 to 18,468—a percentage of 51¼. My Company now give 32 cubic feet for a penny.

MANTLE FACTORIES.

One of the advantages of a supply of cheap gas is to make it attractive to manufacturers. Especially has this appealed in the Wandsworth area to gas-mantle manufacturers. A discount of 15 per cent. is allowed off the ordinary price of gas, not only to the big trade consumer, but for encouragement even to the smallest. There are three gas-mantle factories using a total of 47¾ million cubic feet of gas per annum. The number of employees (mostly girls) is 1400; and the weekly wages distributed are about £1400, which in itself is a good thing for the neighbourhood. A gentleman very intimately connected with the gas-mantle manufacturers, and who keeps statistics of the manufacture, sale, export, and import of gas and mantles, has been kind enough to furnish his computation in showing, in a table, the manufacture and disposal of gas-mantles. As this table is a very interesting one, it is, with his permission, reproduced.

	Millions.	Per Cent.
Mantles made per annum in England	45	100
" " " " " Wandsworth	32	71
" " " " " rest of England	13	29
Mantles used per annum in England	85	
Made in Wandsworth	32	38
" " rest of England	13	15
Imported from Germany	40	47
	85	100
Mantles used per annum in the world	200	
" " " " " England	85	
" " " " " Germany	65	
" " " " " Other Countries	50	
	200	

16 per cent. of the mantles used in the whole world are made in Wandsworth.

Bearing these facts in mind, and also the attraction a cheap gaseous fuel is to trade consumers, it is not to be wondered that

my Directors are encouraged to keep the price of gas as low as circumstances permit. In what may be regarded as a residential neighbourhood, about 70 consumers, using 7¾ per cent. of the total Wandsworth output, get the rebate above referred to.

ELECTRICITY SUPPLY.

Electricity has its uses; and it is employed to a large extent in Wandsworth works for power. There is every reason to do so, as we find it not only a convenient form of power, but, as it is generated by means of first-class gas-engines, it can be made very cheaply. Gas undertakings supplying electricity also to a district is not unknown. Even now the Tottenham and Edmonton Gas Company have a Bill in Parliament to supply part of their district with electricity. We wish them every success. There is no doubt that electricity supply in the hands of gas undertakings could be made more economical than when worked by a separate undertaking.

Steam is generally employed to generate electric current for public supply. From the coal consumed to raise the steam, no residuals are obtained. If gas authorities supplied electric current to the public, they would use gas to generate the current, because it could be supplied at a relatively much cheaper price than steam, owing to the valuable residuals obtained. Gas undertakings have been established many years, and at a moderate additional capital outlay could undertake a public supply of electricity in their respective areas.

THE FUTURE OF THE INDUSTRY.

The future for our industry looks bright. There is plenty of scope to extend our present usefulness, not only in providing more numerous forms of apparatus for domestic comfort, but also for the more extensive use of gas for trade purposes. There can be no doubt that the Institution of Gas Engineers and the District Associations have had a great influence in furthering the success of gas—thus carrying out the function for which they were intended. It is by meeting in a body that ideas are disseminated for our general welfare.

A VOTE OF THANKS TO THE PRESIDENT.

At the conclusion of the address,

Mr. A. F. BROWNE (VAUXHALL) proposed a very hearty vote of thanks to the President. The address, he said, had been most interesting and instructive, and appeared to him to be a model of what a presidential address should be, because it gave the members the writer's own personal experience. Now, Mr. Carr's experience was of great value to this and other Associations. He had been for a considerable number of years the Engineer to a remarkably successful Gas Company. It was not their practice to criticize presidential addresses. There might be matters for criticism in Mr. Carr's address; and if there were, he would no doubt hear more on the subject in the future. At all events, he could assure the President that when the members were privileged to inspect the Wandsworth works under his guidance, if they did not criticize freely, they would ask many questions, because their interest in his works and in his successful management of them had been greatly stimulated by what he had put before them that day.

Mr. W. B. FARQUHAR (Ilford) seconded the vote, which was carried with acclamation.

The PRESIDENT, in returning thanks, said he hoped they would criticize when they went down to Wandsworth. He would do his best to explain anything that might be of interest—and he believed the visit would be of interest.

COAL GAS AS A FUEL FOR DOMESTIC PURPOSES.

By F. W. GOODENOUGH, Controller of Gas Sales of the Gaslight and Coke Company.

IN the last issue of the "JOURNAL" (pp. 668-673) appeared the first of two Cantor Lectures on "Coal Gas as a Fuel for Domestic Purposes," delivered by Mr. F. W. Goodenough before the Royal Society of Arts, on March 3. In his second lecture, which was delivered on March 10, Mr. Goodenough dealt with gaseous fuel for cooking purposes; the question of hot-water supply; the various types of gas water-heaters; the instantaneous, storage, and circulating systems of hot-water supply; and miscellaneous domestic applications of gaseous fuel. Extracts from the lecture are given below.

In his opening remarks, the lecturer said: In my previous lecture, I dealt with the use of coal gas as a fuel in the home in its general bearing on the smoke abatement question, and particularly on the side of its application to the purpose of warming our bodies from the outside, by means of the open radiant gas-fire, in place of the open coal-fire. It now remains for me to deal more especially with the warming of our bodies from within, by means of well-cooked food, which is an even more important problem than the warming of ourselves by external means.

FLUELESS GAS-HEATERS.

Before doing so, I should like to touch—as I did not have time last week in which to do so more than very briefly—upon the use of flueless gas heating-stoves in the house. These are of two kinds. There are, first, what are known as condensing stoves, comprising one or more argand burners with chimneys discharging into copper tubes, in which the moisture produced by the combustion of the gas is condensed and flows into a pan underneath. These condensers are exceedingly useful, efficient, and satisfactory for heating bath rooms, small halls, passages, and other parts of the house where there are no fire-places and where a gentle warmth is sufficient.

Then there are the so-called "radiators" (or, more correctly, convectors), which are similar to steam and hot-water radiators in appearance and mode of imparting heat, but are heated from below by gas instead of being fed with steam or hot water from a central boiler. In some gas-radiators, the heat is conveyed direct from the gas to the tubes by the products of combustion passing through them; in others, water inside the tubes is raised to steam by the heat of the gas, and the heat then passes from the steam to the tubes containing it. Undue pressure of steam and overheating of the tubes are guarded against by a valve, which is automatically reduced in aperture by the pressure of the steam when it reaches the desired point.

The cost of installation in the case of these gas-heaters is, of course, much smaller than that of centrally-heated radiators; and they can be used with much advantage for the heating of large halls, corridors, staircases, and other parts of the house where there is frequent change of air and it is desired to warm that air to a moderate extent.

It will be observed that these so-called radiators heat the air by convection, which is just what a true radiator would not do; and as, moreover, they are not used in conjunction with chimney flues, they are not suitable for the heating of sitting rooms and bedrooms, where heating by radiation is, for reasons previously given, the desirable method of obtaining warmth.

COOKING BY GAS.

Having filled in this gap in his account of the means available for the application of gas for external heating, the lecturer turned to the question of its utility in aiding the processes of internal combustion. Starting with cookery, and pointing out the important position gas holds in the culinary art, for rich and poor alike (there were some 750,000 gas-cookers in London alone), Mr. Goodenough proceeded to deal with the question of cost. In this connection, he instanced a number of points to be remembered in gas cooking, with the view of economizing heat. The effect of the use of gas-cookers on the purity of the atmosphere was referred to, and then the lecturer proceeded as follows:

HYGIENE OF GAS COOKING.

Speaking of the gas-cooker as an instrument of public health, reminds me of the prejudice against gas for cooking which still lingers in the minds of some who will readily acknowledge its convenience—the prejudice, which some have, I mean, against having their food cooked in an oven in which gas is being burnt, and which contains the products of its combustion, which those who are not perhaps quite unbiassed in their opinion concerning the use of gas are fond of calling its noxious fumes, but which really consist of water vapour and carbon dioxide—an inert and perfectly innocuous gas.

It is a curiosity of psychology that people who will insist upon having a steak or a chop cooked on a coke-grill—where it is enveloped in carbon monoxide and sulphurous gases that might well be described as noxious fumes, but which, as a matter of fact, have no effect upon the meat cooked in them other than giving it that taste of the grill which is so much esteemed—are sometimes the very people who "can," they say, "always tell when food has been cooked in a gas-oven." The curious part about it is that they are never known to refuse or criticize food that has been so cooked when it is served to them in a West-end restaurant or a first-class club. Imagination is indeed a magic force!

DIETETIC ADVANTAGES OF GAS COOKING.

Those who entertain this suspicion of gas-cooked food may be reassured. The "Lancet"—that vigilant and even alarmist guardian of the public health—made the question the subject of careful inquiry some twenty years ago, and exonerated gas-cooked food from the suspicion of being affected by the products of combustion.

From the "Lancet," Nov. 25, 1893.—The freedom of the food from any detrimental effect arises from the fact that the cooking operation is so certain and sure that vapours are constantly being emitted from the food, which effectually ward off any odours that may happen to be in the oven, which are then rapidly carried away into the flue by the constant draught of air passing through the cooking-chamber. The flavour and character of the meat or food cooked by gas leave, as experience has shown, little to be desired. Consequent on the sharp heat and a plentiful supply of air around the joint cooked, the juices of the meat are kept in while the excess of fat is eliminated. This is the

reason why, in cooking with gas, the joint is invariably richer in gravy constituents. Moreover, the fat which collects in a pan provided underneath the cooker is cleaner—in fact nearly white; the degree of perfection in this respect depending upon the distance the catch-pan is situated from the source of heat. If it is too close, the dripping is browned; but in some stoves an arrangement is made for drawing the fat away from the burners. Dripping so obtained is beautifully white. Space forbids us entering into a description of the various manifold appliances for cooking by gas, and their several modifications; and we need only add that, in addition to the ease of roasting, gas is equally applicable to grilling, cooking pastry, bread-making, boiling, and most other culinary operations. Moreover, our inspection has satisfied us that in gas cooking-stoves, as in gas heating-stoves, the products of combustion are complete, and that smoke or soot is never produced.

On another occasion, when dealing with this question, the "Lancet" pointed out that the determining factor is that "meat during its cooking is emissive and not absorptive"—just as, to put it another way, one cannot breathe in and out at the same time. On this question, then, of the hygienic aspect of gas cooking, the verdict of medical and scientific authorities is favourable to the modern system of cooking.

The Hot-Water Problem.

Now we come to the question of how the household requirements of hot water can be provided, if the kitchen coal range is abolished. This is a problem which is being more and more considered by the public—especially since it was brought very forcibly to their notice by the coal strike last summer, when many people for the first time realized how much coal the kitchen range uses up in the one simple process of providing a hot bath.

Four Solutions.

There are four principal methods of obtaining hot water, other than by the boiler at the back of the kitchen range; and all the conditions and circumstances of the existing hot-water supply system in the house and the daily requirements of hot water by the household have to be taken carefully into consideration before one can determine what would be the type of installation most likely to prove satisfactory, both in efficiency and economy, for any particular household. All that can be done here is to indicate the different systems that are available, and to emphasize the fact that, given suitable circumstances, each of these systems will be found to be satisfactory and economical—bearing in mind always the diminution of household work and increase of comfort for its members that ensue from the divorce of the hot-water supply from the cooking-stove.

Importance of a Separate Hot Water Supply.

Let me just emphasize the point of the necessity for separating the cooking and water-heating apparatus if the maximum of comfort and convenience is to be obtained in the home. A man comes home from golf an hour before dinner time and wants a hot bath. To his disgust he finds that the water in the bathroom that comes from the tap marked "Hot" is only lukewarm. If he will take the trouble to go down into the kitchen, he will undoubtedly find the dampers so adjusted that the heat of the fire is being applied to the oven instead of to the boiler; and he will then realize that the two alternatives in his house at 6 p.m. are either a hot bath and a badly cooked, unpunctual dinner, or a luke-warm bath and dinner ready to time. Or, again, consider the case of the household where there are children to be bathed in the evening at the same time as dinner is being cooked for the adults in the house.

The Circulator.

Where there is already a circulating system in operation for the supply of hot water, with the kitchen range boiler as the source of supply, all that is necessary, assuming the circulation is satisfactory, is to instal a boiler heated by gas (generally known as a "circulator") alongside the kitchen range, with the flow and return pipe from the circulator connected with the flow and return pipes from the coal-range boiler. This does not affect the operation of the superseded boiler if for any reason it is subsequently desired to use the coal-fire. These gas-boilers or circulators can be fitted with a thermostatic valve, which reduces automatically the supply of gas to the boiler, upon the water in circulation reaching a predetermined temperature. By this means, economy in consumption is secured and over-heating of the water avoided.

Coke or Gas.

These independent circulators can, of course, if desired, be heated by coke instead of by gas; and this is sometimes done, with resultant economy, in large houses where the saving in labour to be secured by the substitution of gas for coke would not materialize in a saving in wages. For constant use for supplying hot water on a large scale, coke is cheaper than gas, if only the cost of fuel be taken into account. Gas, however, can be utilized with a marked balance of advantage for the supply of hot water for all flats (large and small); for all small and moderate-sized houses (especially where no servant at all is kept), or where there is rather much work for one servant and not enough work for, or means to justify, two; for all large houses where money is willingly spent on modern appliances rather than upon wages and keep of servants; and for all those hotels, boarding houses, and institutions where the saving of storage room and of labour is of more importance than the cost of fuel. On the other hand, coke may be recommended for hot water supply for large institutions, schools, &c., where storage room is ample and no saving in caretakers wages could be effected if gas were used instead of coke.

Speaking generally, however, it may be said that, in these days of constantly growing difficulty in obtaining good servants and retaining them when they have been found, the motto of "more appliances—less servants" is increasingly commending itself to the thoughtful housewife, and the gas-heated boiler comes increasingly into favour.

The Storage Boiler.

Where no circulating system with storage tank exists—as in some old-fashioned houses—a system for providing hot water throughout the house can be easily and economically secured by the installation of a gas-heated boiler, in which there is, according to size, storage capacity for from (say) 10 to 40 gallons of hot water, from which there is a direct flow to hot-water taps throughout the house. These boilers are fitted with thermostatic gas control valves, which cut down the consumption of gas as soon as the quantity of water stored in the boiler reaches the desired temperature.

The Califont.

Another type of apparatus for supplying hot water from a central point to a number of hot-water taps is that known as a "Califont," which is an apparatus designed to heat water and distribute it practically instantaneously to any hot-water tap in the house connected to it. The gas-valve is operated by water pressure, so that directly a hot-water tap is turned on the gas, which was previously alight but turned very low, goes up to its full extent, and heats a large quantity of water very quickly, on the same principle as that of a geyser. The question of whether a storage boiler or an instantaneous heater should be adopted in any individual case must be determined by the particular circumstances of the case—especially as to whether the demand for hot water is intermittent or almost continuous.

The Geyser.

Finally, there is the geyser, for supplying hot water at short notice and in a continuous quantity at any given point, such as a bath, basin, or sink. These appliances are frequently adopted where the requirements of hot water are practically limited to the bathroom and the kitchen; the supply for the kitchen being obtained by means of kettles on the gas-stove. Geysers are, like all gas water-heaters, highly efficient appliances, absorbing at least 80 per cent. of the heat in the gas consumed. They can be used with perfect safety, provided that they are fixed to an adequate flue, discharging its products completely outside the room, and guarded against back-draught.

The fixing of geysers without flues cannot be too strongly condemned, as witness the recent sad occurrence in Peckham; and anyone who recommends the use of a flueless geyser for a bath-room incurs very grave responsibility.

Each of these four systems of water heating has its place in the solution of the domestic hot-water problem. Which is the best for any particular household can only be determined after consideration, by an expert, of all the circumstances of the case.

The Refuse Problem.

A question that is sometimes raised in regard to the plan of abolishing altogether the kitchen fire is: What are we to do with our refuse that previously we burned in the fire? Well, the very general use of gas in place of the kitchen range for cooking in the summer has already made it necessary for the local authorities to clear the refuse bins in our cities at much more frequent intervals than in former days; and a daily clearance, such as is general in some of the Continental cities, is ultimately inevitable. But where the problem presents itself as a serious one in large households, it can easily be solved by the installation of a refuse incinerator heated by gas. These appliances have been adopted to a small extent in this country, but to a much larger extent in America, where cooking by gas is so general that a gas-cooker is fitted by the landlord in every flat, as being as much a necessary item in its equipment as a door-handle or an electric bell.

Electricity for Cooking.

It may be said that, in discussing the question of cooking and water heating, I have only referred to the comparative costs and advantages of coal, coke, and gas, and have said nothing about electricity for cooking and water heating, as to which a good deal has been inserted of late in the papers. My reply would be to repeat what I said last week on the subject of electricity as an agent for the heating of rooms—that it is not a practical proposition at the price, or anything approaching the price, at which electricity is at present offered to the public for fuel purposes.

I have, indeed, yet to meet an electrical engineer who is running his undertaking for profit—in contradistinction to one who has charge of a municipal undertaking, where the policy is all too often one of finding "food for the elephant" (which is sometimes inclined to be white in colour), regardless of the cost at which it is obtained—who has any faith in the possibility of electricity being adopted generally as a fuel for domestic purposes. Moreover, even if electricity were obtainable at ½d. per unit, it would still be necessary to bring about a big reduction in the cost of the apparatus, and ensure its maintenance in efficient working order at a much lower cost than is possible at the present moment,

before cooking by electricity could be regarded as a practical proposition to put before the average householder.

I could give some interesting information regarding the experience of householders who have made the experiment; but it is really unnecessary to do more than point out that the maximum quantity of heat obtainable from a unit of electricity can be obtained by the combustion of less than 8 cubic feet of coal gas, which costs on the average less than ¼d.

There is one point in regard to the relative costs of cooking by one fuel or another to which reference is sometimes made, and that is the question of whether meat loses more in weight when cooked by one type of fuel than when cooked by another. It has been freely stated that meat cooked in a gas-oven loses more weight than when cooked in an oven heated by electricity. This can be both proved and disproved—according to the way in which the meat is cooked. If meat is cooked in a gas-oven with a fierce heat, it can be made to lose more of its weight than if it is cooked in an adequate, but not excessive, temperature. It will lose less weight still if it is cooked in a receptacle, such as a "Chicago" oven or a paper bag, placed inside the oven. The effect will then be very similar to that resulting from the cooking of meat in an electric oven, which is more nearly closed to the atmosphere than a gas-oven with a flue.

There is no reason why meat should lose more weight when cooked by gas than when cooked by electricity, if the same resultant condition of the meat is desired—that is to say, if it be desired that the meat shall contain a greater proportion of its constituent moisture at the end of the process of cooking than it contains when cooked in the ordinary way in a gas-heated oven. Most people, however, prefer meat cooked in the open oven, with rather less moisture contained in it and with more outside "browning" effect than is the case when it is cooked in a receptacle within the oven, though for other classes of food—more especially poultry and game—cooking in a closed receptacle, such as a casserole, is, to the taste of many people, vastly better than open roasting.

The point to be remembered is that, with a gas-cooker, you can have it either way; with a stove that is only heated externally, you can only have it one way. The suggestion (which I have seen put forward seriously) that by cooking in a closed oven you can save so much in the weight of cooked meat obtained, as compared with the weight obtained as a result of cooking in a gas-oven, that the reduction will pay for the very expensive fuel consumed in the cooking, can only be described as humbug, and must have been made by someone whose knowledge of cooking was very limited, or whose belief in the stupidity of the public was very profound. Actual tests made under working conditions by an independent and highly qualified *chef* have, in fact, proved that meat can be cooked by gas at one-fourth the cost of cooking by electricity at 1d. per unit, with an identical—or, to be precise, a slightly smaller—proportionate loss of weight.

Having dealt with the heating of the rooms, halls, and passages of a house, and the supply of fuel for cooking and hot water supply, there remain only one or two matters to mention to complete the whole subject of fuel for domestic purposes.

Laundry Work.

In place of the old-fashioned coal-heated copper for the washing of clothes at home, there are now available very efficient gas-heated coppers, which present enormous advantages over the old-fashioned type in regard to rapidity and certainty of heating, saving of dirt, labour, and an atmosphere saturated with steam, and also in regard to economy. These boilers can be employed for the boiling of hams, large puddings, &c., and so are useful adjuncts to a gas-cooker. Irons specially constructed for heating by gas are found exceedingly serviceable for use in connection with laundry work, and both washing and drying machines heated by gas are also available.

Coffee Roasting.

Another application of gas in the kitchen quarters which may be mentioned is its use for coffee roasting. A gas-heated coffee roaster enables one to obtain freshly roasted and ground coffee every day, and makes it more easy for the English cook to compete with her French sister in the preparation of palatable coffee.

Water Distilling and Sterilizing.

Those who attach great importance, or are by their condition of health obliged to pay special attention, to the purity of the drinking water in the house, will take particular interest in the "Normandy" water distiller and the "Forbes" water sterilizer. which have recently been introduced, both being operated by gas.

A reference to the use of gas for garage and greenhouse heating brought the lecture to a conclusion.

ADDITIONAL WATER STORAGE FOR LONDON.

Inauguration of the Chingford Reservoir by the King.

View of the Humphrey Gas-Pump House at Chingford.

In bright sunshine, which fortunately tempered a very cold wind, the large storage reservoir which the Metropolitan Water Board have just completed at Chingford was formally brought into use on Saturday. This important addition to the water storage of London has been about five years in progress; having been commenced on April 11, 1908, when Mr. E. B. Barnard, the present Chairman of the Board, who was then Vice-Chairman and Chairman of the Works and Stores Committee, cut the first turf. The inaugural ceremony was performed by His Majesty the King, who was accompanied by the Queen, and attended by the Home Secretary (Mr. M'Kenna), in the presence of a large gathering, which included the President of the Local Government Board, members of the Water Board and of both Houses of Parliament, representatives of local authorities, a number of eminent engineers and other invited guests. Their Majesties arrived at the reservoir about half-past four, after having had an enthusiastic reception in their journey through the City and East End, and were received by Mr. Barnard, who was presented to them by the Home Secretary. Entering the Royal Pavilion, an address from the Lea Conservancy Board was handed by the Vice-Chairman (Mr. Thomas Gardner, J.P.) to the King, who, in the course of his reply, said:

> The River Lea, over which you exercise so wise a jurisdiction, has claims on our grateful remembrance, not only for its remarkable historic associations to which you refer in your interesting address, but also for its beneficial services in securing to London an ample supply of pure water. Your labours, as you remind us, are united to those of the Metropolitan Water Board in the control of London's vast water system, and for this reason you have a special interest in the inauguration of the great reservoir at Chingford which we are here to-day to celebrate. You will, I am sure, meet the increased responsibilities which the opening of this reservoir cannot fail to create, with zeal and wisdom; and I wish you every success in your labours.

A number of presentations were then made, including the members of the Reception Committee of the Board, Mr. W. B. Bryan (the

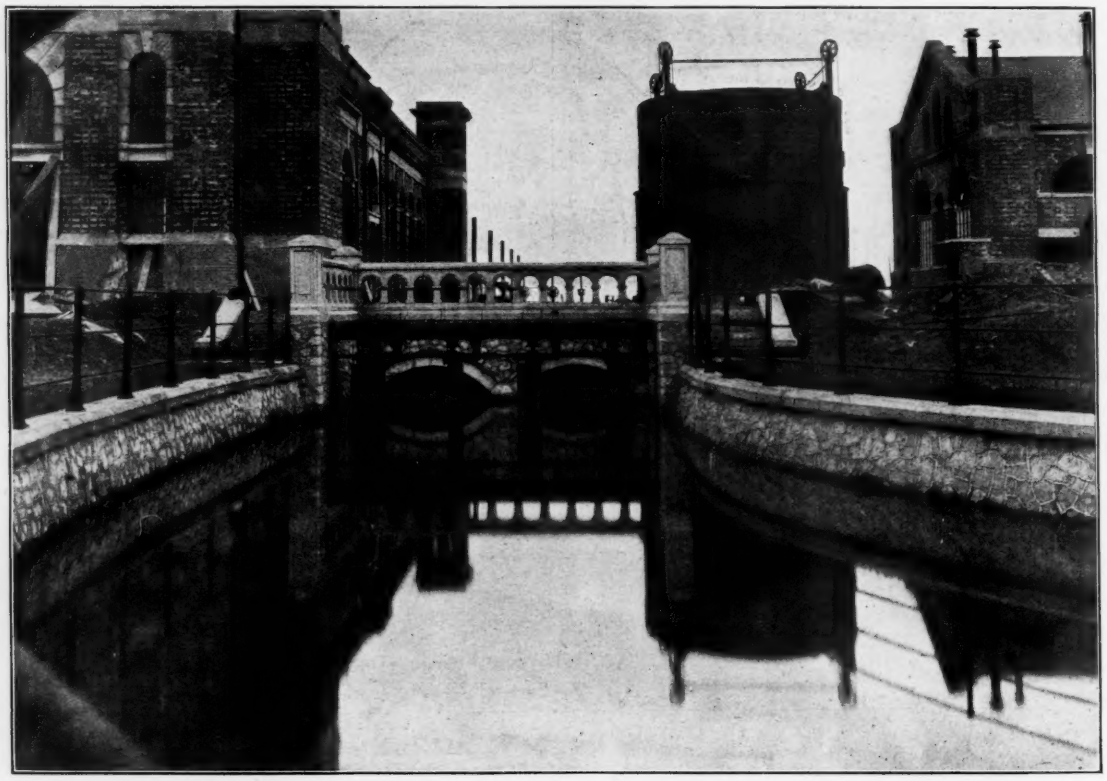
Chief Engineer), Mr. A. B. Pilling (the Clerk), Mr. Charles Wall (a member of the firm of contractors for the reservoir), and Mr. H. A. Humphrey (designer of the pumps), and their ladies.

A procession was then formed, and their Majesties were conducted to a gaily decorated stand, which had been erected in close proximity to the inlet to the reservoir. The Bishop of St. Albans having offered prayers, Mr. Barnard read the following address, which bore the seal of the Board, and was signed by himself and the Clerk:

> The Metropolitan Water Board respectfully beg to express their gratitude for the gracious condescension of Your Majesty and Her Majesty the Queen in visiting the newly constructed Chingford reservoir in the valley of the Lea. Three hundred years ago, the Royal solicitude and financial succour of King James the First enabled the waters of that valley to be brought by the New River from the springs of Amwell and Chadwell to London; and it is a coincidence of great interest, and a circumstance of distinguished favour to the Water Board, that in the tercentenary of the New River Your Majesties should graciously honour the Board by inaugurating the last and greatest of the reservoirs constructed in the valley of the Lea for the purpose of meeting the ever-increasing demands of the Metropolis and parts adjacent for a copious supply of pure and wholesome water. In the furtherance of that purpose, the Board have expended on new works at Chingford and elsewhere a sum approaching £3,000,000 since they assumed the control of the water undertaking in the year 1904; and additional works, involving a further cost of £1,600,000, will shortly be commenced in the valley of the Thames. The laying-out of such large sums of public money involves many anxieties and great responsibilities; but these the Board bear willingly, heartened and encouraged as they are by the gracious sympathy and interest of Your Majesties. The Board most humbly pray that Your Majesties may long be spared to stimulate and assist the local authorities of the Kingdom with "the King's most gracious love" for enterprises great and small in furtherance of the public weal.

His Majesty then read the following reply:

> The Queen and I are very glad to be present to-day to inaugurate the Chingford reservoir, and to witness the completion of this part of your enterprise.
>
> It is interesting to recall the association of my ancestor with the inception of London's water supply when the New River was formed to carry the springs of the River Lea to the heart of the City. The accomplishment of this arduous task in the year 1613 was largely due to a distinguished Welshman, Sir Hugh Myddelton, whose dauntless nature overcame unending difficulties and opposition; and the first official act of his brother, Sir Thomas Myddelton, who was elected Lord Mayor of London the same year, was to perform a ceremony such as I have undertaken to-day. The citizens of London will do well to remember that, after three centuries, they still owe a debt of gratitude to the Lea for the remarkable purity of their water supply.
>
> You are justly proud of this reservoir, which is a splendid monument to the energy of your officers, the skill of your engineers, and the industry of your workmen. We congratulate you warmly on the success of your labours; and we shall ever follow with interest the continued progress of this important undertaking, so vital to the health and well-being of the capital of my Empire.



The Water Intake, Humphrey Gas-Pump House, Gasholder, and Gas House.

At the close of his speech, a golden key was handed to His Majesty, by which, through an electric current, he started the pumping machinery—saying: I declare this reservoir open, and name it "King George's Reservoir." In a few seconds the water began to flow from the five inlet-pipes. At first the quantity was small; but before Their Majesties, who remained for several minutes in conversation with Mr. Barnard and Mr. Bryan, and displayed great interest in the undertaking they had inaugurated, left the stand, an enormous volume of water was being discharged over the steps of the weir.

A return was then made to the Royal Pavilion, where the King unveiled the commemoration stone let into the permanent wall forming one side of the building. It bore the following inscription:

> This Tablet commemorates the completion of the Chingford Reservoir Works on the 15th March, 1913, when the water was admitted to the Reservoir by His Majesty King George V., Her Majesty Queen Mary being present on the occasion.
>
> The works were designed by the Board's Chief Engineer, William Booth Bryan, M.Inst.C.E., and were constructed under his superintendence by Charles Wall, Ltd.

Their Majesties were then conducted through the light and spacious pump-house, where they inspected the powerful Humphrey pumps, which constitute the unique feature of the reservoir. Here, again, the keenest interest was shown by the Royal visitors, whose desire for information in regard to the undertaking was satisfied by Mr. Bryan and Mr. Humphrey, who were among those in attendance.

The inspection of the pump-house was the last item on the programme; and their Majesties partook of tea. During the repast, the King sent for Mr. Wall, and personally congratulated him upon the successful completion of his contract. The Queen having expressed a desire that the golden key which had been used by the King might become her property as a memento of the occasion, it was at once offered for her acceptance. The Royal party left the reservoir grounds about half-past five, and were warmly cheered on their departure.

In the address read by Mr. Barnard, reference was made to the fact that the present year is the tercentenary of the construction of the New River, and the supply of water to London from the valley of the Lea. The opening of their new reservoir seemed to the Board a fitting occasion for presenting to their guests an account of the main circumstances which brought about this intimate association between the Metropolis and the Lea water; and they accordingly had prepared a very interesting *souvenir* in the shape of a pamphlet containing an account of London's early water supply, with a portrait of Sir Hugh Myddelton and reproductions of some old prints, followed by a description of the new reservoir illustrated by photographs of various portions, a number of diagrams furnishing engineering details, and a map showing its extent and position in relation to the neighbouring

reservoirs. From this pamphlet the particulars given below have been taken.

It only remains to say that the large number of guests were invited to accept the hospitality of the Chairman of the Board at luncheon; and that the full band of the Grenadier Guards rendered selections of music during the afternoon.

The Reservoir and Other Works.

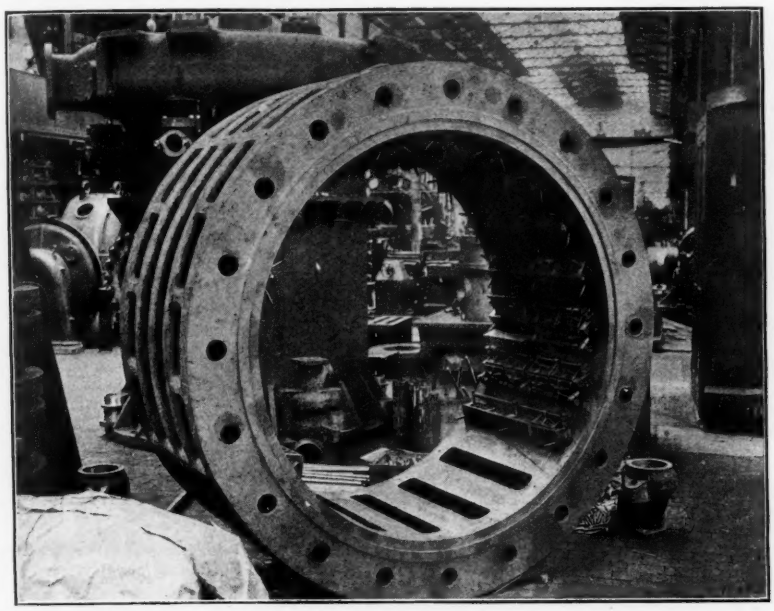
The extreme length of the reservoir at water-line is 1 mile 1190 yards, and it has a capacity of about 3000 million gallons. The area occupied, including banks, is about 500 acres. The top water area is 416 acres, and the length of the embankment 4½ miles. A short embankment has been thrown across the centre, to prevent excessive wave action during high winds. It has three openings giving free access for water to each side. The main banks of the reservoir contain about 2,400,000 cubic yards of earth, &c., of which 253,000 cubic yards are of puddle —*i.e.*, clay. The inner banks are lined with about 105,000 square yards of concrete and brick paving.

The reservoir will be filled from the northern end with water pumped from the Lea. This water will be stored in the reservoir for a considerable period, during which purification processes of great value will take place by the agency of natural forces; and after this the water will flow through regulating towers into a tunnel, and then along a channel very nearly two miles in length to the existing distributing basin adjoining the Chingford Mill pumping-station, and thence by existing channels to the chain of reservoirs, twelve in number, constructed under the earlier Acts of the East London Water Company. The outlets from these reservoirs are connected to a wide open channel about 2100 yards in length, which conducts the water to the beds at Lea Bridge, where it is filtered and thence pumped into the district.

The River Lea ran longitudinally through the site of the actual reservoir works. The river has accordingly been diverted into the new channel 3½ miles long, extending from a point north of the reservoir, near to Enfield Lock, to the Chingford Mill pumping-station. This diversion was one of the first parts of the work undertaken, and has been of the greatest utility during the construction of the reservoir, since it efficiently carried off all the winter floods, and saved the reservoir works from inundation. An intercepting channel 3¼ miles in length has also been constructed for the purpose of collecting surface water from the eastern side of the valley, and discharging it to waste into the River Lea below the intakes. In its journey of two miles from the reservoir to the distributing basin, the stored water is therefore protected from pollution by the intercepting channel on the east and the river diversion on the west.

In substitution for the old and inconvenient Lea Valley Road, which was covered with water in flood time, a new road has been constructed across the valley between Ponders End and Chingford, and is carried by bridges over the River Lea diversion, the outlet channel, and the intercepting channel. Occupation bridges have also been constructed across these waterways at various points.

The reservoir, river diversion, bridges, roads, pump-house, cottages, and other buildings and works, were designed by the Board's Chief Engineer (Mr. William Booth Bryan, M.Inst.C.E.); and they have been constructed under his supervision by Messrs. Charles Wall, Limited, the Contractors to the Board, at a cost of about £550,000.

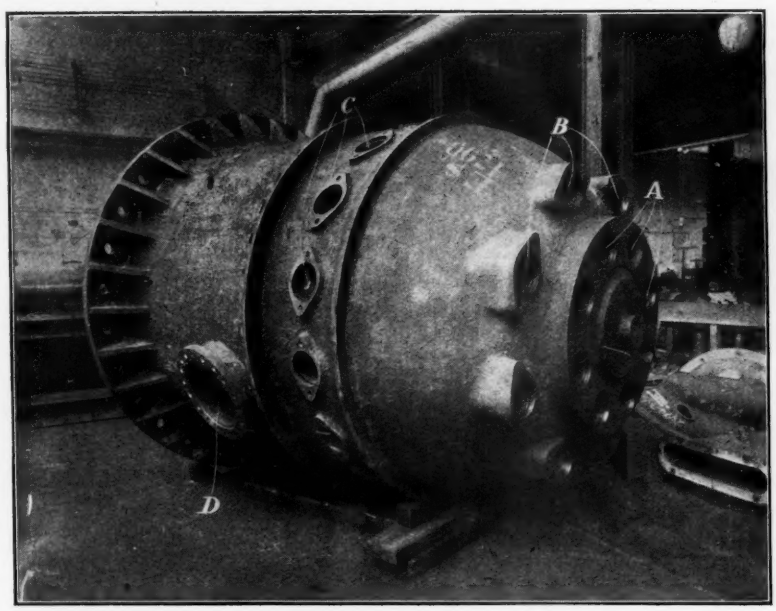


One of the Two Suction Valve-Box Castings for the Twenty Million Gallons per Day Humphrey Gas-Pump—Showing the Valve-Seatings and the Valves partly fitted.

The Pumping Plant.

The pumping-station is at the north end of the reservoir; and unusual interest attaches to it by reason of the fact that the pumping plant employed is unique in waterworks construction, consisting as it does of an installation of Humphrey pumps, in which the action of the internal combustion cylinder is directly applied to the raising of water.* The pumps have been designed by the inventor, Mr. H. A. Humphrey, M.Inst.C.E., of the Pump and Power Company, Limited, and constructed by Messrs. Siemens Bros. Dynamo-Works, Limited, of London and Stafford.

The great economy of these pumps results from the employment of the internal combustion principle; and, as the explosion takes place in direct contact with the water to be lifted, there are no transmission losses, and the apparatus is of the simplest possible construction. Each pump may be looked upon as a gas-engine and pump combined, but without piston, cross-head, connecting-rod, crank-shaft, fly-wheel, bearings, gearing, or stuffing-boxes. All these parts found in ordinary pumps are dispensed with in the Humphrey pump. The only working parts are the valves; and of these the admission valves for combustible mixture and the exhaust valves for burnt products are all placed in the combustion chamber, and the valves for admitting fresh water are placed circumferentially round a vertical valve-box placed between the combustion chamber and the bend which connects to the horizontal pipe.



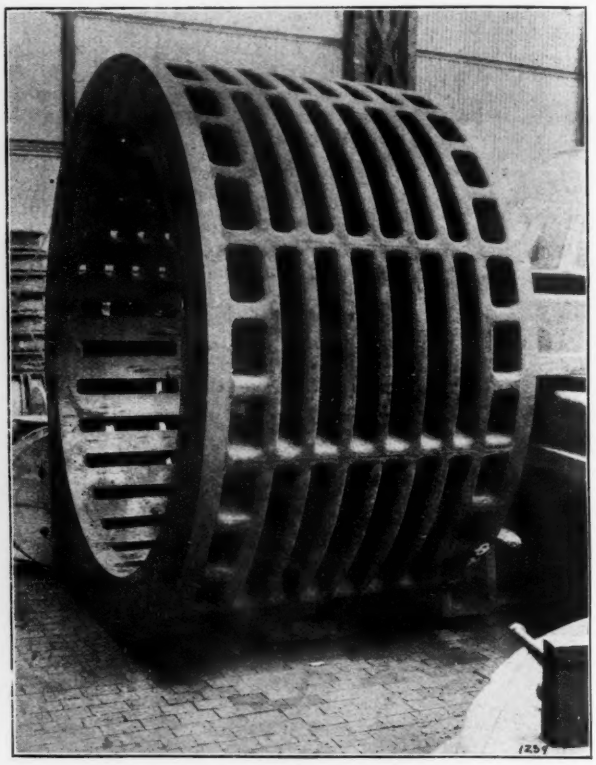
One of the 7 Feet Diameter Combustion Chamber Castings.

A. Ports for Scavenging Air-Valves. B. Ports for Admission Valves. C. Ports for Exhaust Valves. D. One of two manholes, the covers of which are fitted with relief valves.

The five pumps erected at the Chingford reservoir include four large units and a smaller one. Each large unit is capable of delivering 40 million gallons of water per day. The small pump is of half this capacity; and the total installation will therefore

* This pump has been several times referred to in the "JOURNAL;" the most recent occasion being on Jan. 28 (p. 252), when an interesting description of it was given in a paper read by Mr. H. de P. Birkett, B.Sc., before the London and Southern District Junior Gas Association.—ED. J.G.L.

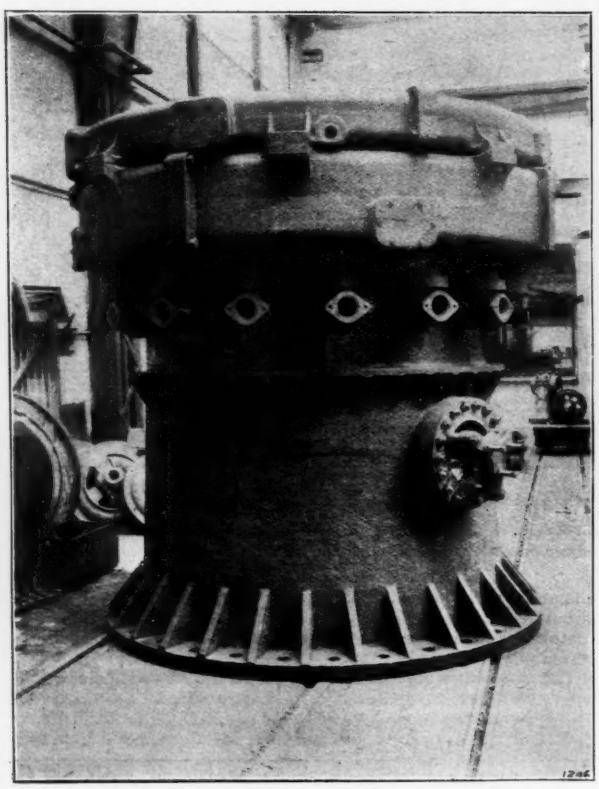
One of the Four, 7 Feet Diameter, Combustion Chamber Castings for the Forty Million Gallons per Day Gas-Pumps.



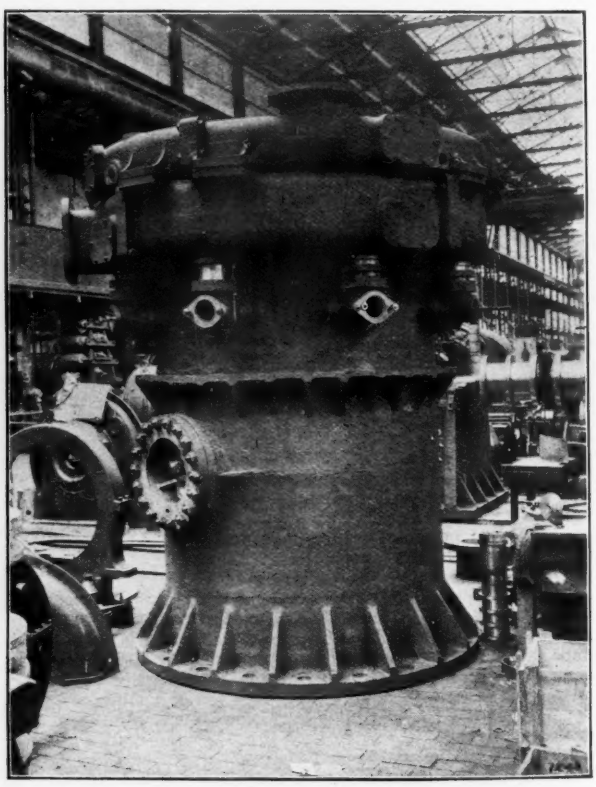
The Suction Valve Box Casting (Two per Pump) for the 7 Feet Diameter Gas-Pumps—Each Forty Million Gallons per Day.

deliver 180 million gallons per 24 hours. To give some idea of the size of one of the larger pumps, it may be mentioned that the combustion chamber and valve-box are both 7 feet diameter, and the bend connecting them with the horizontal pipe is 7 feet diameter upon one face and 6 feet diameter upon the other. The horizontal pipe is 6 feet diameter throughout, and the vertical tower at the other end gradually increases in the shape of an inverted cone until it is 15 feet diameter at the top. If a person passed from end to end inside the apparatus, he would find a perfectly clear and unobstructed waterway, and it would look more like a large empty pipe than a piece of machinery. On each explosion in one pump 12 tons of water will be taken out of the River Lea and delivered into the reservoir.

The best popular conception of the apparatus is that of a huge swinging pendulum, formed of the mass of water, which moves to and fro, but always in such a manner that at each cycle 12 tons of water leave the apparatus at the high level, while 12 tons of fresh water enter at the low level to take its place. The pumps can be stopped and started instantaneously by merely controlling a switch on the electric ignition circuit, so that it is



The Combustion Chamber for One of the Four Pumps—Each Forty Million Gallons per Day—Showing the Exhaust and Gas-Belts Fitted.



The Combustion Chamber (partly fitted) for the Twenty Million Gallons per Day Pump.

possible to have all five pumps at rest one moment and yet all working at full load half-a-minute later.

Extent of the Board's Operations.

In connection with the opening of the reservoir of which particulars have been given, it may not be uninteresting to reproduce, from the *brochure* already mentioned, a few statistics showing the magnitude of the Board's operations. They are as follows:—

Statutory area	560 square miles.
Population supplied	6,629,165 at census of 1911.
Storage	13,000 million gallons.
Filters	169 acres.
Daily supply	244 million gallons.
Length of mains	6334 miles.
Fire-hydrants	63,218.
Engines	270, of 41,195 total horse power.

The population supplied is nearly a million more than the total population of Australia and New Zealand, and represents 15 per cent. of the population of Great Britain and Ireland. The magnitude of London's water supply is therefore almost that of a nation rather than a community. The average supply per head per day in 1911-12 was 36½ gallons. In the summer it reached 42½ gallons, or more than a barrel of good water every day for each man, woman, and child in a population of nearly 7 millions. The supply to each house every day would weigh nearly a ton.

A circumstance peculiar to the London Water Supply, as compared with that of the great provincial cities, is that, whereas these cities for the most part derive their supplies from reservoirs on elevated uplands, whence the water flows to the consumer by gravitation, the London supply comes from sources lower than the ordinary ground level, and therefore every pint of it has to be raised by powerful pumps to the service reservoirs. This means, in effect, that this vast quantity of water is raised every day in the year to a height equal to that of the Nelson Column in Trafalgar Square. Notwithstanding this, the Londoner gets his water of a quality beyond exception at a price which does not exceed 1¾d. for 100 buckets full.

THE CENTENARY OF GAS LIGHTING; AND ITS INDUSTRIAL DEVELOPMENT.

In this title there is the subject-matter, and to spare, for a *magnum opus*. But Mr. W. J. Liberty, the Inspector of Public Lighting for the City of London, attempted the impossible task of compassing the great history into a single lecture. He wrote, and his filled manuscript grew into sheafs. He attempted to condense it; the result was still great. In the end, when Mr. Liberty came to deliver the Gas Centenary Lecture at the meeting of the Illuminating Engineering Society last Tuesday, he had to give, within the space of two hours, the merest sketch of the mass of historical fact that he had laboriously gathered together. To an extent this caused the sequence of the history to be somewhat disjointed. But it was not the fault of Mr. Liberty; it was the fault of the vastness of the history.

It is a long time since we have seen the hall of the Royal Society of Arts filled to overflowing as on this occasion; and among the audience there was a good number of men identified with the London and Suburban gas undertakings. The north of the country was also represented, as in the absence of Sir Corbet Woodall (the President of the Institution of Gas Engineers), who in these days has to avoid as many evening engagements as he conveniently can, and the Senior Vice-President, whose duties retained him in Liverpool, the Junior Vice-President (Mr. John Bond, of Southport) took the chair, at the request of the Society of Illuminating Engineers. Those present were promised a big evening; and they got it, what with the lecture, the pictorial illustration from the founders of the gas industry through to many of the latter-day workers, and various scenes in progress, as well as the exhibits of ancient and modern gas-burners and lamps.

Honoured Names and Early History.

We cannot reprint the lecture—its voluminous character and the necessity for some limitation deny us that pleasure. As a matter of fact, there is no such complete history of the gas industry in existence as that found in the 120 volumes of the "Journal," and, of course, history cannot be altered much, other than in the manner of treatment. Therefore (but we want to ensure that this shall not detract from the vast credit due to Mr. Liberty for his industrious research and compilation), we must confine ourselves to indicating the course of the lecture rather than take from it any amount of its substance. The opening words seemed to contain almost a touch of regret that a task of such stupendous character as the lecture represented had been taken up so lightly. Then it was explained that last year was not the centenary of gas lighting, but the centenary of the Gaslight and Coke Company as a chartered concern, and therefore of statutory gas enterprise. The names of the workers in the "discovery period" of gas were heard: Shirley, Dean Clayton, and Murdoch; and combined with the last named in the "initiatory period" were Winsor and Clegg. In chronological sequence, too, we had paraded before us the names of men who have contributed largely to the history: Malam, Peckston, Lowe, Alexander Wright, Thomas Livesey, Sir John Thwaites, Croll, Evans, Newbigging, Hunt, King, Dr. Letheby, Hartley, Sir George Livesey, Sugg, Bray, Sir Corbet Woodall, Carpenter, and Lewes. Those who (not mentioned in the foregoing) have been stars in the parliamentary firmament include the names of Hawksley, Barlow, Hughes, Stevenson, Spice, Penny, and Michael. We were introduced again to the early events associated with the birth of statutory gas history. The lighting of the Lyceum Theatre and of Pall Mall; and the oft-quoted records that have been transmitted from that day were named—records which showed a combination of doubt, fear, and ridicule. The pioneers had a mass of ignorance and prejudice to penetrate. The lighting of Pall Mall in this connection is always quoted; but, it seems, that a trial in the City came but a few months later. Mr. Liberty remarks: In a circular, dated July 10, 1807, the Clerk to the City Lighting Commissioners wrote: "Having had an offer to try the experiment of lighting the public lamps with gas, the same will be put into execution in Golden Lane and Beech Street, in the Ward of Cripplegate Without, Monday night next, and continued every night until the following Monday (July 15 to 22)." The experiment was so satisfactory that gas at once became the permanent means of illumination.

From Small Beginnings.

The origin of the Chartered or the Gaslight and Coke Company and the association of Winsor with it, served as an opportunity for a quotation from an old volume published by John Williams, in 1828. It seems from this that the first meeting to further the Company, and to raise capital, was held at the London Tavern; and it was on June 24 that the first meeting of the incorporated Company was held in Norfolk Street. The volatile character of Winsor, as sketched in the recent centenary volume of the Gaslight and Coke Company, and previously in Mr. Charles Hunt's "History of the Introduction of Gas Lighting," and Mr. Newbigging's "One Hundred Years of Gas Enterprise," was depicted; and yet we in these days cannot help admiring Winsor's "courage and persistency, and his foresight as to the uses of gas." Murdoch was a man of different calibre. He was shrewd, practical, persevering, and reserved as to the merit of his own work. Here the names of Boulton, Watt, and Clegg were introduced—Clegg who was the first engineer of the Gaslight and Coke Company, and whose work surmounted initial obstacles that were placed in the path of practical advancement. As evidence of the very small beginnings from which the Chartered Company sprang, it may be mentioned that the Company's territory in 1812 was but 10 acres; while to-day the area is more than 120 square miles. The capital of £200,000 has risen to about £30,000,000; and while they started with a coal carbonization of 4000 tons per annum, they now carbonize the equivalent of 2,250,000 tons of coal annually. The rateable value of the concern at the start was £150 10s. 4d. Now the amount paid in rates and taxes is upwards of £300,000; while a penny reduction in the price of gas on the 25,484,985,000 cubic feet annually sold, represents a sum of about £100,000.

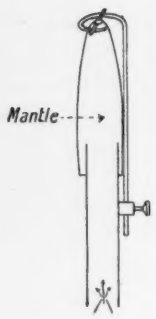
The gas rental mode of doing business and its failure, the appearance of Accum and others in the new field of enterprise, all fell into orderly place in the tale. Main-laying proceeded more rapidly than the business, the growth of which was retarded by the ignorance and prejudice that abounded. But still gas illumination was making way; and gas illumination gave a very large fillip to the opportunities for the educational enlightenment of the nation. New developments arose; fresh industries came into being; a stimulus was given to scientific research. The pioneers soon found the need of auxiliaries to the main invention. There came the invention by Clegg of a self-extinguishing gas-tap, so constructed that the gas could not flow to the burner when the flame was extinguished; and later there was his self-acting gauge for measuring and registering the quantity of gas delivered by any pipe. The waste of gas on the part of the consumers in those days was ruinous for the companies; and some measurer was then a desideratum.

The lecturer passed on. There came the days of severe competition in London; and ultimately the districting of areas, through causes well known to gas men. New companies sprang up throughout the country; and invention of plant, to which Malam contributed, proceeded. A dip into Clegg and other sources of information showed the fundamentals of some of our present practices. In 1825, the Imperial Continental Gas Association and the European Gas Companies were commenced, mainly through the instrumentality of Sir William Congreve, who was Home Office Inspector of Gas-Works in the Metropolis. Mention of this gave the lecturer the opportunity of pointing out how British capital has carried gas supply to all quarters of the globe. In dealing with the ruinous rivalry of Metropolitan Companies, mention was made of the launching of the South Metropolitan Company in 1833. So precarious, said the lecturer, was its early existence, that it was seven years before the unfortunate shareholders received any profits. In 1847 it had a capital of no less than £19 per ton of coal carbonized, equalling about £2000 per million cubic feet sold; but, by careful management, this was reduced by the year 1860 to £550 per million feet.

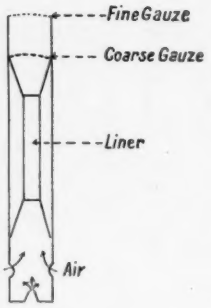
Quality and Distribution.

The quality of the gas supplied in those early years was not of a character that would be tolerated to-day. In 1842, the question of the impurities contained in coal gas was investigated by a Committee; and then commenced a battle royal on the subject, in which Dr. Letheby figured largely, and which culminated in

The Lamp Formerly Used in City of London Streets. That shown was recently removed from a Court in the rear of Newgate.



The Original Burner.



The Original Scott-Snell (Provisionally Protected) Welsbach Burner.

The New Low-Pressure Lamp now being Installed in the City of London.

restriction. In 1847, there came the first Gas-Works Clauses Act. The impurity trouble continued for years after that; and in 1860 it was supplemented by the mischief that was alleged from the escape of gas from the distribution systems. The remedy that was then proposed was of a twofold character: (1) To supply gas freer from ammonia and sulphur compounds; and (2) the use of tighter joints. Already in some of the large towns of England (for example Liverpool, Manchester, and Leeds) the latter remedy had been applied; the ends of the pipes being turned-and-bored, and fitted into each other by grinding "like a stopper into a bottle."

In City Limits.

In the midst of the mass of historical facts, we have the formation of the Great Central Company mentioned; and in their case the authorities fixed the standard of illuminating power at 12 wax candles. The price of gas in those days had been high; but competition had reduced it, and the Great Central Company appears to have adopted a sliding-scale of price in relation to quantity, running from 4s. to 3s. The lecturer pointed out that it was worthy of remark that under their Act of 1851 the supply of gas was voluntary on the part of the Company, though all legislation afterwards made it compulsory. This enabled him to say, incidentally, that the Corporation of the City of London have always taken a leading part in the gas affairs of the Metropolis, having expended upwards of £29,000 in promoting Gas Bills and gas legislation generally during the years 1860 to 1880. In 1868 they had a Bill in Parliament (which proved abortive) authorizing them to become the gas authority for the City of London, with works at North Woolwich. The Great Central Company was formed by Mr. Charles Pearson and Mr. Alex. Angus Croll, the latter of whom, in conjunction with Mr. William Richards, invented the dry meter.

Unrestricted competition continued until the Metropolis Gas Act of 1860 was passed. Prior to that time the cheap-gas agitation was started—the demand being (as Sir George Livesey once stated) that the price of gas should be reduced from 6s. to 4s. Other companies were started south of the Thames. But there as elsewhere competition did not pay, and there was districting on both south and north of the Thames. In the Metropolis Gas Act of 1860, the price was fixed at 4s. 6d. per 1000 cubic feet for 12-candle power gas. Then followed a period of greater prosperity; and the companies began to pay their full 10 per cent. In 1861 the price of gas south of the Thames was 4s. 3d., with a minimum charge of 30s. a year, whether or not the gas was used.

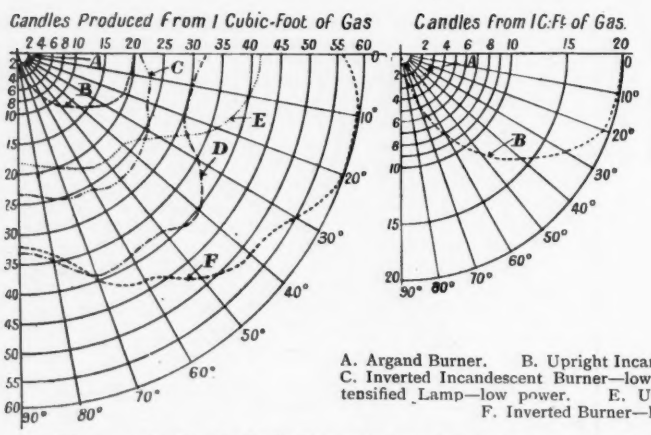
The Part of the "Journal" in those Times.

The "Journal" is now in its sixty-fifth year; and in 1864 it was taking a somewhat prominent place, under the editorship of Mr. Thomas Greaves Barlow, in the work and agitations of the period, and in the laying of the legislative foundations. It did its part then, as it has always endeavoured to do, in the interests of the industry. If, therefore, an extract is taken from the lecturer's remarks at this point, we are sure that we shall not be charged with undue vanity over our historical association with the industry. Mr. Liberty writes:

> In July, 1864, a closely printed and scientifically interesting pamphlet—filled with tables, dated from No. 42, Parliament Street, and signed by Thomas Greaves Barlow (the first publisher of the "Journal" then issued quarterly)—was addressed to the Directors of the Chartered, City of London, and Great Central Companies. It dealt exhaustively with the question of the "Sulphur Compounds Present in the Companies' Gas," and in that of the Newcastle-upon-Tyne and Nottingham. At the latter place the writer was assisted by Mr. Thomas Hawksley. The treatise also dealt with the practice of the Paris Gas Company in reducing sulphur by raising the temperature of the retorts high enough to effect the distillation in four hours, and suggested that the London Companies should try the experiment at one of their works. Mr. Barlow also mentioned the process patented by the Rev. W. R. Bowditch, of Wakefield, of passing the gas over lime heated to 450° Fahr., or the melting point of tin. . . . Mr. Ellissen was associated with Mr. Barlow in his investigations for the London Gas Companies. In the same year, Dr. Letheby gave his opinion on the reports of Messrs. Barlow and Ellissen, condensing and tabulating them; mention being made of the experiments of Mr. Bowditch, Dr. Angus Smith, and Mr. Hawksley's communication to the "Journal of Gas Lighting." . . . In September, 1867, an interesting pamphlet was issued dealing with the labours in Parliament of the authorities during that session in connection with the Bills of the Imperial and the Chartered Gas Companies. The pamphlet was a reprint from the "Journal," and was published for distribution. It contained the speech of Mr. Bontems, the Chairman of the Special Gas Committee, in which he continually refers to the "Journal." For instance, he says: "Then look at the money spent in agitation! The 'Journal of Gas Lighting' says that £100,000 have been lost in parliamentary expenses since the year 1857."

The Present Stage.

We need not carry the history of development and progress to



A. Argand Burner. B. Upright Incandescent Burner—low power. C. Inverted Incandescent Burner—low power. D. Inverted Intensified Lamp—low power. E. Upright Burner—high power. F. Inverted Burner—high power.

Diagrams showing the Light Obtainable from One Cubic Foot of Gas per Hour by Various Methods.

Diagram showing the Superior Lighting Efficiency and Light Distribution of the Inverted Burner as compared with the Upright.

the point which Mr. Liberty had necessarily to go, in order to show the present position of affairs—the gigantic place occupied by the industry in the public service, and pictorially rather than in other ways the position now occupied in the engineering world by the manufacture and distribution of gas. The early retort-house and the modern machine-equipped one were illustrated; and the perspiring coke man with his barrow, and the modern conveyor. The early diminutive holder was brought into contrast with Sir George Livesey's mammoth creation at East Greenwich. Progress, never ceasing, is written over it all. Included in the progress is co-partnership; and Mr. Liberty supplied some statistics referring to it.

Gas as an Illuminant.

The lecturer had to deal hastily with the second part of his lecture, which treated of the progress of gas as an illuminant. It was in its prepared form as voluminous as the first part; and while there is interest in it all, the practical consideration is that we have left behind the crudity of the old forms of using gas as an illuminant, and have got on to a scientific basis, which has given us a manifold duty per cubic foot of gas used as an illuminant. Mr. Liberty seems to have scoured the world for evidences of early street lighting; and he told us much that greatly interested about what was done in the matter of lighting London streets in the days anterior to gas supply. This part of the lecture gave him an opportunity of introducing to notice the fine collection of burners, ancient and modern, that he had on view—the early cockspur, cockscomb, batswing, rat-tail, and argand—down to the modern high and low pressure inverted burners and lamps. The lecturer stated that Professor Lewes informed him that recently when in Ireland he saw rat-tail burners still in use; and the lecturer says he was surprised, when in Glasgow in 1911, to find that the city authority had more than 45,000 rat-tail jet burners in use in the closes and on the common stairs throughout the city tenements.

At the beginning of the century, when gas was paid for by burner, not much encouragement was given to the consumption of gas. Here is an example of the Wandsworth Company—

1821.

No. 1 argand, dusk till 9 p.m.	£2 10 0
10 ,,	2 16 0
Gas at 10s. per 1000 ft. 11 ,,	3 4 0
All night	4 8 0
If burnt on Sunday, one-sixth extra.	
One jet for hall, or passages, 4-inch flame	1 10 0

And of the Bodmin Company—

Description of Burner.	From Dusk to—		
Gas 10s. per 1000 Feet.	9 o'Clock.	10 o'Clock.	11 o'Clock.
No.	£ s. d.	£ s. d.	£ s. d.
1. Single jet	1 0 0	1 4 0	1 8 0
2. Double jet	1 5 0	1 10 0	1 15 0
3. Treble jet	1 12 0	1 18 0	2 4 0
4. Batswing	3 10 0	3 17 6	4 5 0
5. Eight-hole argand	2 2 0	2 9 6	2 17 6
6. Twelve-hole argand	2 15 0	3 2 6	3 10 0
7. Sixteen-hole argand	3 10 0	3 17 6	4 5 0

One hour extra allowed on Saturday nights.

A reduction on £2 2s. lights, and above, of 2s. each, on taking four lights, and upwards. An addition of one-sixth for gas consumed on Sundays.

The contribution to advances in the use of gas for illumination of William Sugg and George Bray came under notice; and their work supplies quite a chapter in the history. Welsbach naturally received great prominence; and what Sir Corbet Woodall, Mr. Carpenter, and others have done to advance the acme of lighting in streets and homes was all brought into the survey. Introduced here were some street lighting experiments made by Mr. Liberty in 1896; but they do not refer to the present time, and so we must pass them by. The work of Wenham, Siemens, and Scott-Snell was reviewed; and the Moffat, the Lucas, the Welsbach, the Sugg, the Podmore dust-proof lamps, the "Nico," "Metro," Bray, Bland, "Dacolite," King, Graetzin, and the Mansfield burners were illustrated or described. We take from the illustrations thrown on the screen by Mr. Liberty some polar curves showing the progress of gas illumination. Then came the story as to the progress of the high-pressure system—slow at first; rapid in recent years. What can be said that is new on this subject to "Journal" readers, who have been kept carefully informed of every step forward? Nothing at the moment.

Thanks.

There were some speeches made at the end of the lecture—all congratulatory, and thanking Mr. Liberty. The vote of thanks was proposed by the Chairman (Mr. J. Bond) in graceful terms; and Mr. W. Doig Gibb seconded it in his usual genial manner. He mentioned some historical documents as to the early days of gas lighting in Edinburgh that have come into his possession; and in them he finds that Sir Walter Scott was the Chairman of one of the earlier gas companies of that city. Mr. F. W. Good-enough supported the vote; and Mr. Gaster added his tribute—asking at the same time for a larger support of the Society from the gas industry by membership. The motion was heartily carried. There was response by Mr. Liberty; and then Mr. Bond was cordially thanked for his services in the chair.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Poplar Works of the Commercial Gas Company.

On Saturday, some fifty members of the Association paid a visit to the Poplar works of the Commercial Gas Company. They were met at the entrance by Mr. P. E. Williams, the Engineer, Mr. A. E. Williams, the Assistant-Engineer, Mr. W. F. Brown, and Mr. F. G. Cox, by whom they were conducted over the works.

The works occupy a site nearly 20 acres in extent, on the River Lea—practically opposite to the Bromley works of the Gaslight and Coke Company, to which the Association paid a visit some weeks ago. The whole of the coal is brought up to the works by the Company's own steamers of 700 tons, and is unloaded by Armstrong hydraulic cranes, with self-acting grabs, and discharged into hoppers. From the hoppers, the coal is conveyed in trucks to the retort-houses or into store, by means of overhead gantries which run through the yard, and are also continued into the retort-houses. There are four of these hydraulic cranes on the wharf, but only two are in active use for unloading coal. One is employed for loading sulphate, and minor purposes of this character; and the fourth is out of use. Passing from the river, there is noticed an underground cutting running from the wharf to the base of the retort-houses. This is now seldom utilized; but it was employed in the old days to remove the coke by the aid of locomotives. With regard to the storage of coal, it is, of course, only possible to take a certain amount into the retort-houses; and the remainder, when brought up by the ships, is taken out to the yard on the overhead gantries, and tipped in heaps. There are two of the gantries in parallel lines; and between them travels a steam-crane, which, as required, picks up the coal again from the yard, and loads it into trucks, which are run into the retort-houses.

As to the retort-houses, it may be remarked that there are four of these on the works, built at right angles to the river bank. Only two, however, are used at the present time; the other two being fitted with out-of-date settings of the hand-charged, direct-fired type. The two in operation—Nos. 3 and 4—are provided with Arrol-Foulis chargers and Williams-M'Phee dischargers, worked by hydraulic pressure. They contain respectively 21 and 20 settings, each of ten retorts in five tiers; the retorts being 20 feet by 22 inches by 15 inches, of the usual ⏢ pattern. The settings are of the Gibbons type, with single regenerative furnaces. Dillamore tar-towers are fitted; while a special feature is the Williams-M'Phee patent articulated pipe system, comprising an arrangement of pipes and jointed connections for the conveyance of water under very heavy pressure from a fixed point to the hydraulic machines in motion. An illustrated account of this ingenious method of superseding rubber hose was given in the "Journal" for Dec. 17 last, p. 896. There is also in use the Williams-M'Phee design of furnace-poker. The coke is taken from the retort-houses by a De Brouwer chain conveyor (being quenched in its travel), and elevated into hoppers outside for storing and screening. There is an installation of eight hoppers, in connection with which a rather novel feature was pointed out, in the form of an automatic jigging screen at the base for grading the coke into three different sizes. The coke is then removed by diminutive locomotives to barges or to the water-gas plant, while the breeze is removed to the boiler-furnaces. The De Brouwer inclined conveyor leads on to a level conveyor, which, when necessary, allows the coke to pass the hoppers and be placed in the yard. The coke-handling plant is driven by "National" gas-engines. Just at the present time—the heaviest season having passed—No. 4 retort-house is not under fire; and the members were able to see some of the benches in process of being repaired. In this house, the coal is delivered direct to the Arrol-Foulis machines by overhead trucks; while in No. 3 house it is elevated to a hopper. Outside the houses—two to each house—are hydraulic lifts for the removal of clinker, which by this means can be brought to the road level, and then taken away to the tips. The two old houses, which have for the time being ceased to fulfil the purpose for which they were originally built (but instead are being used for storing coal, &c.), offer, it need hardly be remarked, excellent opportunities for the installing, when required, of some up-to-date method of carbonization.

The exhauster-house contains six exhausters. Two of these—originally two-blade ones, but recently converted to the Waller four-blade type—are of a capacity of 220,000 cubic feet per hour, driven by Gwynne horizontal steam engines. The other four exhausters are driven by Tangye and Hunter and English vertical engines; the capacities being 100,000, 90,000, 80,000, and 35,000 cubic feet per hour. All of them are direct coupled. Passing two Pelouze and Audouin tar-extractors, a pause is made to examine the plant for extracting cyanide according to the Williams process. Particulars of this arrangement were given in a paper read by Mr. A. E. Broadberry, of Tottenham, before the Eastern Counties Gas Managers' Association [see "Journal" for Oct. 1 last, pp. 31-32]. It consists of a special form of purifier box, in which spent oxide is used, in a layer 2 feet deep placed on grids. In the bottom of the box, there is a simple form of tar-extractor; steam and water-sprays are also provided. At the Poplar works, sulphocyanide is made, instead of the customary ferrocyanide. One of Mr. Williams's special boxes is now in use; and, fortunately,

just at the moment a larger one is in course of erection, so that it is possible to examine the interior arrangements.

Moving on, after as thorough an inspection as possible of this interesting portion of the plant, we come to a fine installation of five horizontal Lancashire boilers, fitted with forced-draught furnaces, which provide steam for the exhausters, as well as for the Arrol-Foulis hydraulic compressors. In the power-house, there are four of these hydraulic pumps, giving a working pressure of 700 lbs. per square inch; and a 48 I.H.P. "National" gas-engine for driving an air-lift pump, which raises water from an artesian well for general purposes. There is also a small Keith compressor for high-pressure lighting, which it is intended to utilize on the wharf.

Purification is carried out entirely by oxide of iron; there being a total of twelve boxes for coal gas and four for carburetted water gas. In the older purifier-house there are six boxes, of the cast-iron water-lute type. They are discharged from the bottom, and are provided with hydraulic elevators for lifting the lids, and a small steam-crane for raising the oxide from the floor below the purifiers when required for charging purposes. The new purifier-house contains eight luteless purifiers—four on one side for coal gas, and four on the other for water gas. The remaining two boxes, which were formerly used as catch-boxes, are outside this house. Electric lights are installed in the purifying and engine houses. In the station-meter house there are two 100,000 cubic feet Parkinson meters, and one of 150,000 cubic feet capacity by the Gas-Meter Company. One of the meters is used for the carburetted water gas, the other two for coal gas. Leading from this is a room containing a station-governor and a good assortment of photometrical and other testing apparatus. A feature of the works is the range of fitters', blacksmiths', tinsmiths', and carpenters' shops, in which practically all the repairs needed on the works are carried out. The blacksmiths' shop, too, possesses a point of interest particularly its own, in the shape of a Tangye gas-hammer. This works on the principle of a gas-engine, but with an uncompressed charge; and it is said to enjoy the distinction of being the only appliance of its kind in existence in London at the present time. It is a powerful hitter, but naturally some little difficulty is experienced in regulating it to the nicety that is possible with a steam-hammer. The two holders attached to the station are of 3¼ million and 1¾ million cubic feet capacity—giving a total storage of 5 million cubic feet.

In going round the works and the yard, one is struck with the excellent order which everywhere prevails; and it should be mentioned that a nice piece of ground is set apart for use as allotments. Passing from the timekeeper's office and well-fitted little chemical laboratory, there is noticed a Blackett washer. This is used to separate clinker and coke in the case of pan breeze, or for separating coke and shale when dealing with ordinary coke breeze. It is a simple but effective form of apparatus; and those who are interested in it may be reminded of the fact that a machine of this type was described in an article which appeared in the "JOURNAL" for Feb. 21, 1911 (p. 514). A relief holder and two oil storage tanks, holding 110,000 and 360,000 gallons, indicate that one is approaching the carburetted water-gas house, in which there are two sets of Humphreys and Glasgow type, each of a capacity of 1¼ million cubic feet per day. As already stated, the coke is brought to the house by small locomotives, and is then elevated by a hydraulic lift to the working stage. Two Sturtevant fans are belt-driven, by Marshall horizontal steam-engines; and one fan is driven by a De Laval steam-turbine. There are three water gas exhausters, the capacity of which is 80,000 cubic feet per hour in the case of two, and 100,000 feet in the case of the other one. Another boiler-house with an installation practically the same as that already alluded to furnishes the steam for the sulphuric acid and sulphate plants and for the carburetted water-gas apparatus.

The sulphate plant is capable of producing 10 tons of sulphate of ammonia per day; there being four stills working on the intermittent principle. A steam-driven centrifugal drying machine, fitted with a copper basket, is installed; and the two saturators are provided with Williams and Fenner's outside cracker pipes. The Company convert the ammonium sulphocyanide into calcium sulphocyanide, in which form it is sold. There is storage room for about 350 tons of sulphate. The sulphuric acid plant, in which spent oxide alone is used, is capable of turning out some 100 tons a week. About three years ago, Glover and Gay-Lussac towers were added to the plant; but before that time it was worked simply with a final coke-scrubber. In conjunction with this plant, there is a small engine-house, in which are installed compressors for driving the acid to the top of the towers.

At the conclusion of the inspection, the party assembled for tea, after which

The PRESIDENT (Mr. D. J. Winslow) made a few remarks, in which he spoke of the pleasure it gave the members to be at Poplar, and of their indebtedness to Mr. Stanley H. Jones for having consented to the visit. They had seen many interesting things—among them being the water-softening process (which was quite home made, automatic in its action, requiring no attention, and most economical, the oulay being but a few pence per day, while the capital charge was a negligible quantity), the Williams' discharger (the chief characteristic of which was that there was nothing to get out of order), the special cyanide process (for which they were indebted to Mr. Williams' inventive skill), and the sulphuric acid plant (which had been erected by men at the works). He felt that the Commercial Gas Company might be called the "Worker's Friend," as, owing to the nature of their area, they issued such a large number of slot-meters, while they were largely concerned in establishing the use of gas for industrial purposes, and more specially for furnace work. He felt very grateful indeed to Mr. Williams.

Mr. J. HEWETT (Junior Vice-President) moved a hearty vote of thanks to the Directors of the Company, to Mr. Stanley Jones, and to Mr. Williams for the visit that day. They had been especially struck by the adaptation of old plant to modern uses, by which it had been made to answer all purposes equally well with some of the more modern plants they had seen from time to time. He particularly noticed the sulphuric acid plant, by which the spent oxide was used over again, thus getting all they could out of it—for which credit must be given to Mr. Williams. Inspecting a sulphuric acid plant was never a very pleasant matter; but they must all, as they went round, have noticed the absence of SO_2. With an area so restricted, and not liable to any expansion of its borders, the Company had wisely decided upon a policy of concentration, and had successfully endeavoured to extend the industrial side of gas supply. [Applause.]

Mr. W. H. VANNER, in seconding the vote, said when going through the retort-house he was struck with the many little improvements in connection with the stoking machinery, which had saved both trouble and money. They thanked the Directors for their hospitality.

The vote having been carried with acclamation,

Mr. WILLIAMS responded, and stated that Mr. Stanley Jones had written him expressing regret at his inability to be present, and saying how warmly he appreciated the efforts of the Association. He (Mr. Williams) desired to say that it gave him a great deal of pleasure to welcome the members to Poplar. The work of the various Associations and their visits created that spirit of comradeship and good feeling which existed in no other profession to the same extent. He thanked them cordially for their hearty vote. He had endeavoured to improve the machinery at the works, and they had now an output of about 1900 million cubic feet per annum. If he and his assistants had given the members any pleasure that afternoon, they considered their time had been well spent.

BENZOL FROM COAL BY THE DEL MONTE PROCESS.

IN previous issues of the "JOURNAL" reference has been made to the Del Monte process for the production of oil and gas from coal; and in the number for the 29th of October last (p. 370) will be found an article giving some particulars of the process, accompanied by an illustration of the plant employed in connection with it. The services of Mr. W. J. A. Butterfield, M.A., F.I.C., were obtained to test the plant; and his report, preceded by a few observations by Mr. J, Owen, is contained in the issue of "The Car" for the 12th inst. In view of the interest attaching to the subject, we give some extracts from the report.

Mr. Butterfield observed the working of the demonstration installation of the plant at Barnes throughout the trial runs with different kinds of coal and one cannel, and determined the quantities of the various crude products obtained. These he examined with the view of ascertaining their value for the production of commercial products. The plant was operated by Mr. Leon del Monte and his colleague, Mr. Smith Everett; but all the quantities were measured, the products collected, and the necessary control tests made by Mr. Butterfield. The coals and cannel used are described, and the products yielded given, in appendices to the report. From the observations and results recorded, Mr. Butterfield is of opinion that the process is "capable of affording a yield of about 3 gallons of motor spirit from one ton of most descriptions of house and gas coal." It will also, he says, "yield per ton of such coals from 12½ to 15½ cwt. of a coke, or fuel of the coalite class, suitable for use as a smokeless fuel in domestic grates. It will yield further per ton of coal from 85 to 105 lbs. of pitch of high quality, from 20 to 35 lbs. of sulphate of ammonia, from 1¾ to 2¼ gallons of naphtha, and from 2¾ to 4 gallons of heavy fuel oils." Having regard to the prevailing price of motor spirit, Mr. Butterfield is of opinion that the naphtha and fuel oil should be subjected to a subsequent cracking process, which, if properly conducted and controlled, will, he says, give a yield of 2½ to 4 gallons of motor spirit—making a total of 5½ to 7 gallons of motor spirit per ton of coal. He adds that the oils produced by the process are of a nature amenable to cracking, which is not the case with ordinary coal-tar oils.

Dealing with the cost of the process, Mr. Butterfield points out that the coal used may be slack or small coal, provided it is bituminous caking coal; and assuming that such coal is obtain-

able in a given locality at 12s. per ton, the expenses per ton for working the process would be the cost of the raw material *plus* wages and fixed charges, which he puts at 7s.—making a total of 19s. Against this, he gives the receipts as follows:—

	s.	d.
Smokeless fuel (semi-coke), 14 cwt., at 15s. per ton	10	6
Sulphate of ammonia, 27 lbs. (less cost of acid, &c.)	2	0
Pitch, 100 lbs., at 55s. per ton	2	6
Motor spirit, 6 gallons, at 10d.	5	0
Residual oils, disinfectants from tar acids, &c.	0	6
Total	20	6

Mr. Butterfield says the figures indicate that the process should be capable of being worked at a profit in places where the price obtainable for semi-coke or smokeless fuel is not less than 25 per cent. more per ton than the cost per ton of the coal used (slack or small coal), and where the wages, working expenses, and fixed charges can be kept as low as about 7s. per ton of coal carbonized. The yield of sulphate of ammonia might, he points out, be augmented by suitable means, and the return from this source increased; while with a few coals, a yield of more than 7 gallons of motor spirit per ton might be secured. In his view, "the success of this process for the distillation of coal depends upon the plant being established in a locality where a suitable grade of small coal is obtainable at low prices, and where there is a good market for the semi-coke or smokeless fuel." If attention is paid to these points, he considers that, under proper technical supervision, "the plant should, so long as the market values of motor spirit, sulphate of ammonia, and pitch do not fall much below their present level, yield a good return of profit." With regard to the application of the process to the distillation of cannel or shale, Mr. Butterfield thinks it can only be worked successfully if the profit of oils from the particular material is sufficient to produce, after the cracking of the heavier oils, at least 20 gallons of motor spirit per ton of cannel or shale.

There are three appendices to the report. In the first, Mr. Butterfield, as already mentioned, gives a description of the plant and the methods of working; in the second and third he deals with the coals used and the products obtained. The plant was described in the article in the "JOURNAL" previously referred to; and the following are the principal portions of the second and third appendices.

The raw materials used in the trials were Ravensworth Pelaw and Askern coals and a Scotch cannel. The first was provided at Mr. Butterfield's request as being a typical gas coal, by which a comparison of the process with existing gas-works methods could be readily made. The second was suggested by Mr. Del Monte and Mr. Everett as being suitable for use in the plant; and Mr. Butterfield considered it sufficiently typical of a large class of coals to be acceptable for a trial. The cannel was tried by desire of the two gentlemen above named, who, however, were not at liberty to give Mr. Butterfield any information as to its origin. In some respects it resembled a shale rather than a true cannel. The customary laboratory tests of these materials gave the following percentage results:

	Ravensworth Pelaw.	Askern.	Cannel.
Moisture	1·66	7·05	3·80
Volatile matter (exclusive of moisture)	28·92	35·65	50·10
Coke	69·42	57·30	46·10
Ash	7·37	5·90	16·75

The stock of Askern coal from which the portion used in the trial was drawn had been stored in the open, and, owing to heavy rain, was very wet, as the proportion of moisture shown above indicates. Mr. Butterfield says it would be fair to assume that in normal conditions this coal would contain less moisture, and that in ordinary working an increase in the yields per ton of about 5 per cent. for all products, except ammonia, might be anticipated on this account.

The third appendix is the one of special interest to "JOURNAL" readers. Mr. Butterfield gives the quantities of crude products actually obtained in the trial run with each coal, calculated to the corresponding quantities per ton of coal, as follows:—

	Ravensworth Pelaw.	Askern.	Cannel.
Date of run	Jan. 29, 1913	Jan. 22, 1913	Feb. 5, 1913
Duration of run	9¼ hours	8 hours	10 hours
Coke or dry solid residue left in the retort	16 cwt. 8 lbs.	12 cwt. 66 lbs.	11 cwt. 103 lbs.
Do., per cent. by weight of coal	80·4	63·0	59·6
Oil or tar extracted, including some pitch deposited in connections, &c. (after deduction of water or liquor)	14½ galls.	14½ galls.	62 galls.
Ammoniacal liquor	69 ,,	66 ,,	22 ,,
Gas	5700 cub. ft.	8120 cub. ft.	3300 cub. ft.

The following are some particulars in regard to the

PRODUCTS YIELDED BY THE DEL MONTE PROCESS.

Coke.

The coke or solid residue from the Ravensworth Pelaw coal varied greatly in character. That which had been adjacent to the walls of the retort contained only 2·46 per cent. of volatile matter, and was a hard coke closely resembling the coke produced from the same coal by the ordinary gas-works processes. The solid residue from the core of the charge in the retort was pasty and only partially carbonized. It contained 17 per cent. of volatile matter—indicating that the charge had not been carbonized uniformly, and that the gas which was circulated through the retort had passed near the walls of the retort and only to a small extent through the central portion of the charge. Mr. Butterfield says the pasty condition which a coal of this class assumes on heating had undoubtedly prevented the gas passing through the bulk of the charge; and he is of opinion that "it will be extremely difficult to obtain uniform dissemination through the charge of the circulated gas with all coals which soften and become pasty on heating—such as the bulk of the gas coals from the Durham district." He considers that, so far as this class of coals is concerned, an attempt to circulate gas through a charge in a vertical retort is unlikely to present any advantage over ordinary methods of distilling such coal. It is conceivable, however, that when continuous feed of coal and withdrawal of coke are applied to the retort worked on this system, the charge would offer less obstruction to the passage of gas through it. About 80 per cent. of the coke or solid residue obtained in the trial would, in his opinion, have about the same market value as gas coke; but the remaining 20 per cent., being the softer portions of the core of the charge, would suffer in transport and would be less valuable than gas coke.

The coke or solid residue from the Askern coal was fairly coherent and firm. It contained 12·26 per cent. of volatile matter. It lighted readily and burnt brightly, with a small amount of flame but no smoke, in an ordinary fireplace. It was more tender than most gas coke, and rather greater care would be necessary to avoid an excessive production of small coke or breeze in handling and transporting it. Mr. Butterfield thinks that it should have a market value for domestic purposes rather higher than that of gas coke.

The solid residue from the cannel retained the form of the raw material charged into the retort and was friable. It contained 5·5 per cent. of volatile matter. Mr. Butterfield says it would have no value as a fuel except for providing producer gas for heating the retorts or for other purposes.

Oils.

The crude oil or tar obtained in all the trials contained a large proportion of liquor in intimate admixture; hence the apparent volume of tar or oil obtained from the coal was much greater than the quantity of true tar or oil after deduction of water. Mere observation of the volume of crude tar or oil obtained in both trials of this kind is very deceptive as to the quantity of real tar produced. The tar or oil obtained was distilled, and the proportions of various products, calculated to the equivalent quantities per ton of coal carbonized, are as follows:—

	Ravensworth Pelaw.	Askern.	Cannel.
Motor spirit (sp. gr. about ·780), distilling below 100° C.	1·70 galls.	2·15 galls.	3·1 galls.
Naphtha, distilling between 100° and 170° C.	1·75 ,,	2·12 ,,	9·1 ,,
First middle oils, distilling between 170° and 230° C.	1·80 ,,	1·36 ,,	4·2 ,,
Second middle oils, distilling between 230° and 270° C.	0·70 ,,	1·46 ,,	5·3 ,,
Heavy oils, distilling between 270° and 300° C.	0·30 ,,	1·05 ,,	5·0 ,,
Pitch, or residue left on distillation	101 lbs.	90 lbs.	370 lbs.

Mr. Butterfield remarks that the yield of motor spirit on a working scale would be about 25 per cent. higher than that found in these trials, owing to the loss inseparable from working on a small scale. The yield from the Ravensworth Pelaw coal would have been greater by about 10 per cent. had the coal been completely carbonized, and that from the Askern coal greater by about 5 per cent. had the coal been dry. He concludes that on a working scale the yields of motor spirit directly obtainable from the coal by this process would be: For the Ravensworth Pelaw coal, about 2·3 gallons; for the Askern coal, about 3 gallons; and for the cannel, nearly 4 gallons.

The naphtha and middle and heavy oils were free from naphthalene. The first middle oils contained tar acids equivalent to 17 per cent. of their volume for the two coals, and to 15 per cent. of their volume for the cannel. The heavy oils contained a certain amount of a waxy deposit. The chief value of all these oils would be for fuel purposes in Diesel engines, or as solvents and vehicles for pitch, bitumen, &c. Mr. Butterfield thinks they should, as a whole, have a market value at the present time of about 3d. a gallon.

The pitch from the Ravensworth Pelaw coal contained 5·4 per cent. of free carbon, and that from the Askern coal, 5·1 per cent. Both are high-grade pitches which should have a market value at least 25 per cent. higher than ordinary pitch from gas-works tar. The pitch residue from the cannel was a soft mass resembling the similar residue from crude shale oil; and it would, in Mr. Butterfield's opinion, be valuable only as a flux for asphalt, &c. Its market value would be much less than that of coal-tar pitch.

Ammoniacal Liquor.

The total ammonia contained in the ammoniacal liquor and in the gas was as follows:—

	Ravensworth Pelaw.	Askern.	Cannel.
Ammonia per ton of coal . .	4·125 lbs.	6·50 lbs.	2·02 lbs.
Equivalent in sulphate of ammonia per ton of coal . .	16·000 ,,	25·25 ,,	7·85 ,,

Mr. Butterfield explains that the yield of ammonia in the case of the Ravensworth Pelaw coal is lower than it should be, owing to the imperfect carbonization of the whole of the charge. In all cases the yield obtainable on the working scale may be reckoned as about 25 per cent. higher than that realizable in this demonstration plant—viz., the yield of sulphate per ton on the working scale would be: From the Ravensworth Pelaw coal, about 20 lbs.; from the Askern coal, about 32 lbs.; and from the cannel, about 10 lbs. The yield of ammonia is considerably affected by the amount of moisture in the coal and of steam in the gas circulated; and by suitable control of the steam, there is no doubt the yield could be appreciably increased. The production of sulphate of ammonia per ton of coal carbonized in large gas-works averages about 26 lbs.

Gas.

The volume of gas recorded in the case of the two coals is partly air drawn in through slight leaks in the connections on the vacuum side of the circulating pump. After washing for the extraction of ammonia and benzol, the gas would, in most situations, be of value only as a fuel for heating the retorts. In a large installation, it should nearly suffice as fuel for this purpose.

Value of the Process to the Motor Industry.

In the course of some "Editorial Jottings," the following remarks on the Del Monte process were made in the number of "The Car" containing Mr. Butterfield's report:

The results are so satisfactory on the whole as to lead us to believe that we are not so far from the production of a home-made fuel in adequate quantities as some experts would have us believe. It is fairly well understood now that the small yield of benzol from coal by the ordinary high-temperature coke-oven methods cannot be expected to influence either the supply or the price of petrol. The yield must be doubled and trebled without affecting the commercial value of the remaining products if the distillation of coal on a very large scale is to be carried on as a paying industry primarily with the object of obtaining motor spirit. In the present case, the direct yields during the trials are not as high as they might have been, in consequence of the loss inseparable from working on a small scale. But Mr. Butterfield expresses the opinion that the Del Monte process is capable of affording a direct yield of about 3 gallons of motor spirit from one ton of most descriptions of house coal and gas coal, and by subjecting the naphtha and heavy oils to a subsequent cracking process, from 5½ to 7 gallons. On this basis, the treatment of 12 million tons of coal a year would be ample to meet all the demands of the motor industry for some little time to come; whereas by the coke-oven methods it would be necessary to treat nearly as much as 100 million tons. We are, moreover, assured by Mr. Butterfield that this is possible by the quantity and value of the other products. From each ton of coal so treated there is a yield of from 12½ to 15½ cwt. of a coke of the "coalite" class, suitable for use as a smokeless fuel in domestic grates, from 85 to 105 lbs. of pitch of high quality, from 20 to 35 lbs. of sulphate of ammonia, from 1⅜ to 2½ gallons of naphtha, and from 2¾ to 4 gallons of heavy fuel oils suitable for Diesel engines.

An important advantage of the Del Monte process is that it is continuous, or can be made so, and that small or slack coal can be used with equally good results. Since we hear so much nowadays about "cracking," we are wondering whether this practice could not be more extensively developed as a separate enterprise. As to the cost of working the process on a full scale, even on Mr. Butterfield's conservative estimate, a profit of 1s. 6d. per ton is shown, with the prospect, by skilful management, of an appreciable increase. It does not sound much certainly. But it must be remembered that the distillation of coal is a business in which many thousands of tons of coal are treated every day; and it needs little imagination to see that, where only a couple of thousand tons are turned over, it will mean a net profit of £150 a day—a sum not equal, perhaps, to the profits of the oil trusts, but very substantial nevertheless.

HIGH-PRESSURE GAS DISTRIBUTION.

By N. B. Hodgkin, of Birmingham.

[A Paper read before the Midland Junior Gas Association, March 15.]

Owing to the large amount of matter which requires to be dealt with in this issue of the "Journal," the portion of Mr. Hodgkin's paper which was arranged for publication has been divided into two parts. The second part, together with a report of the discussion that took place at the meeting of the Association on Saturday, will be given next week. Mr. Hodgkin summarized his contribution; and the interest of his remarks was added to by the display of a large number of illustrations and specimens of different appliances, &c., referred to in his paper—a fact which makes it all the more regrettable that there was not a larger number of members present at the meeting, at which the results of so much labour were placed before the Association.

I purpose dealing as briefly as possible with a few of the more interesting types of apparatus in connection with high-pressure distribution, which I have been associated with. I considered actual practical experience would be of more value and greater interest than a long discourse upon matters allowing but little controversy. A wide field has been touched upon; and the discussion, to my mind, will be of greater value than the paper.

Research and laboratory tests are of no value unless they become public property; and, apart from Birmingham, what is the proportion of research work done in comparison with the undertakings comprising the units of the gas industry? In March last year, Mr. E. W. Smith spoke of the need for a British gas engineers' technical research laboratory. The British Commercial Gas Association have now a firm footing; and we are realizing how much it was needed. Is it not a fact that one is intimately connected with the other? With a laboratory equipped and maintained in a proper manner, a great stride and impetus would be made and given to the industry. For instance, a small undertaking requires particulars of a furnace for melting a certain metal. At the present time they are dependent upon either the makers or their own efforts. With a proper laboratory, they could state their requirements and receive absolutely unbiassed and true results of workings, with complete drawings and specifications to meet their particular case. Another undertaking requires advice as to the best of certain makes of lamps. By sending them along, they could be properly tested, and the right one selected.

Fires, geysers, and every type of gas apparatus could be placed upon the test-bench, and private dossiers sent regularly to the managers of the various undertakings, with the results. Inevitably, it would follow that poor and shoddy materials would give place to first-class goods, and manufacturers as a whole would realize the necessity for chemical and physical research, on their own works, in order to keep up to date, and maintain a good standard. With competition rampant, it is imperative that our goods be of the best quality only, that we should keep forging ahead, and not rest content with what we have achieved. The public insist upon having good value for their money; and it is "up against" the industry to see that no expense is spared so that they may have the value. One factor, also, must not be forgotten—that the finest advertisement we possess lies in the fact that our goods must be placed advantageously, and fixed by only first-class men, with a solid theoretical and practical knowledge. It is of no use giving the public first-class goods, unless the goods be fixed to advantage; and for this reason it behoves each individual to acquire all the knowledge to be obtained, and becomes incumbent upon the chiefs of each staff to see that intelligence is adequately remunerated, and opportunities given for study to those desirous of so doing.

Mains.

In Birmingham, we have about 15¼ miles of high-pressure main. Commencing with a 24-inch cast-iron trunk main from the Windsor Street Gas-Works, branching and subdividing to the various parts of the city and environs. The whole distributory scheme is planned with the idea of procuring a continuous flow of high-pressure gas through each section of the main, as in the arterial system. Ultimately the branches of one artery will be connected to branches of other arteries; and when any section of the main between two valves is shut down for testing or repairing purposes, there will be gas up to both valves. This is essential, as there are so many industrial concerns dependent upon a constant supply of high-pressure gas for manufacturing purposes continuously during day and night, that to them the shutting-down of a main for a comparatively short time is a serious matter. Both cast-iron pipes with socket-and-spigot joints and wrought-iron tube with screwed joints have been laid; and as the pressure is equal to 12 lbs. per square inch, particular attention has been paid to the joints.

It is a debatable question which is the better, cast iron, wrought iron, or steel. The distributing engineer has to be guided by practical experience and results. The various soils must be taken into consideration. With sand, gravel, and rocky subsoils, cast iron is safe, because subsidence of the ground through climatic and other causes is a negligible quantity, and the natural friability of cast iron is not likely to be put to the test.

For jointing, lead or lead wool, with tarred yarn, may be used. In consequence of the tremendous pressure exerted by the jointer in caulking, there is a danger of splitting the socket end of the cast-iron pipe. To prevent this, it is a good practice to have adjustable wrought-iron straps, fastened with bolts and nuts at the top and bottom. A set of clips made for the various sized pipes is inexpensive; and by fixing them to the pipes when caulking operations are in progress, their initial cost is quickly repaid. These clips are invaluable when re-caulking old joints or making alterations to an existing main.

Where running sand, soft clay, and treacherous subsoils are encountered, wrought iron or steel is to be preferred. It will bend and give better. Very long lengths can be laid, thereby reducing the number of joints to a minimum. If laid with a good fall to the syphons, there is little fear of pockets of water collecting; and the greater the angle from the horizontal, the better is any tensile strain taken up throughout the length of the main. For smaller mains—say, 6 inches diameter and less—wrought iron or steel is to be preferred, on account of its greater adaptability; and, wherever possible, there should be mains on both sides of the road, with valves at intervals, each opposite to the other, a small bye-pass connecting up the opposite section of main. For repairs, only a small section of the main need be shut down. The bye-pass valve and the two main valves are closed; thus the section is isolated. There is no danger while the men are at work; and the only people inconvenienced are consumers taking their supply of gas from the section of main between the valves.

To distinguish the high from the low pressure gas from water mains, and to procure additional strength where drilled, the mains are of this section.

Section through Main.

All steel and wrought-iron mains should be well wrapped with specially prepared canvas, and then coated with bituminous material, to prolong the life of the tubes. The valves more generally used are of the double-faced type, of full bore, with removable bonnets. In the larger sizes, they have inspection covers at the sides and bottom—thus enabling the working parts of the valve, with the exception of the parallel disc-plates, to be inspected or renewed at any time by shutting-down. This is made possible by the disc-plates being slightly tapered on the backs. Consequently, when being closed they gradually tighten against the face of the slides. The rack being longer on one of the discs enables the pinion to wedge the faces of the valves and discs by its turning with tremendous pressure. As can be readily understood, the complete and satisfactory working of the valve will depend mainly upon the correct working of the spindle and the true facing of the disc and slides. The syphons in general use are of the type mentioned in Mr. Hewett's paper last year.

Service-pipes should always be of wrought steam tube, with screwed joints, and of not less weight per lineal foot than the following table denotes.

Inches.	Lbs.
¾	1·58
1	2·232
1¼	3·25
1½	4·0
2	5·5
2½	6·5
3	8·0
4	9·7
6	14·5

The initial cost is heavier in comparison with ordinary gas tubing; but this extra initial outlay is more than counterbalanced by the greater durability and life of the steam tube. There is less likelihood of leakage at the joints, for steam tube withstands a greater tensile strain. Consequently, there are fewer breakages caused by subsidence of the ground. Bending allows pockets of water to collect, and corrosion of the pipe to commence.

In laying service-pipes, take great care to have a good covering, never less than 2 feet. Lay with as large a fall as possible to the main. The greater the angle at which the pipe is laid from the horizontal, the better is any tensile strain distributed throughout the entire length of run. Have the bed of the trench perfectly level, as, with a good fall and a level trench, there is less likelihood of the pipe sagging, or subsidence of the ground affecting the service in any marked degree. Have the lengths of pipe as long as possible, to avoid numerous joints. Treat the threads of sockets and pipes, making sure that the mixture is brushed well into the crevices.

The following materials should be used for jointing: Either red and white lead mixed to the consistency of thick cream, with good boiled oil. Gold size and boiled oil. [This must be used quickly.] Graphite cement as prepared. It is important to paint the inside of all fittings, as well as male threads on pipe, so that in screwing up the cement is pushed on into the fitting and makes a solid wall of cement at the end of the pipe inside the fitting.

All services or outlet pipes underground should be laid in wood troughing, either V or square in shape; afterwards being covered with a mixture of pitch, tar, and sand to form a concrete—say, one of pitch to three of tar. Tar alone does not set any too well. All tar should be treated with lime to neutralize the acids contained before treatment. Bitumen can also be used as a coating material. Great care must be taken that the tube is thoroughly covered. Pipes have been taken out of the ground with an excellent covering of cement on the top, but none on the bottom; consequently, the bottom surface has corroded. The danger of not properly covering the pipe with cement can be easily obviated by either the driving of nails, or threading pieces of wire through the troughing, ⅜ inch up, at regular intervals. The mixture, on being poured into the trough, completely envelopes the pipe.

When filling in trenches, ram the sides before the top. Never use ashes, chemical refuse, or sand containing saline matter for filling trenches, as they have a corrosive action on the pipes. It is always necessary, if the pipes have to be laid in soil consisting of chemical ashes, to use galvanized iron tubing, and to put clean sand or gravel round pipes in such soil, to preserve the services. Avoid where possible laying pipes in soil with vegetable growth, because of the acidity, which is very strong, often eating through the pitch and tar protection and corroding the pipes.

The size of the service-pipe is usually determined by the requirements of the consumer; but it is good business to take other factors into consideration. For instance, a consumer may require a supply for lighting only, and has coke furnaces for melting metal. It is more than likely high-pressure furnaces will later on be used for this purpose. If a service pipe, ample in size for any demand that could be required for his business, is laid at the commencement, the initial cost is very small in comparison with the expense entailed with laying a second service, breaking up the road, and re-instatement charges. Never have a service-pipe laid just large enough for present requirements.

Governors.

With the growing popularity of high-pressure gas for industrial purposes, it has become necessary to increase the main pressures. Consequently, as pressures beyond 4½ inches of mercury are not commensurate with economy and efficiency for lighting purposes, we must govern our supplies. Again, with compressors fixed on their own premises by consumers who are some distance away from the main, and are unable to obtain a supply of high-pressure gas from the town main, it is often advisable to fix a governor in conjunction with the compressor—more particularly on very large installations.

Governors may be of two kinds—mercurial or those having leather diaphragms. Mercurial governors are fixed usually where the pressure is increased to not more than 27 inches water-column, as these governors are often fitted to existing installations. Careful consideration should be given to the following points: Note carefully the size of the pipes. They must be ample in size for any demand that may be made upon them. Never fix a mercurial governor where there is a perceptible oscillation caused by machinery or vibration due to heavy traffic. Have the governor large enough, as, no matter how well constructed, it acts to a certain extent as a check to the free flow of gas. Govern the velocity, not the volume.

With very large installations, where it is found necessary to govern the sections near the compressor, set the governor to the pressure obtained when all the lights are in use—that is, the lowest mean pressure delivered at the time of highest output. You obtain an even pressure, and have a correspondingly good mixture of gas and air at the burners. Such a result, therefore, keeps the burners clean, and free from carbon deposits. Maintenance is better and less costly. Be careful with the mercury, lest a little of it comes in contact with the metal drum of a wet meter, which it will melt like a soldering iron. The air-vent must be kept clear. It is absolutely necessary for correct working that the governor be fixed dead-level.

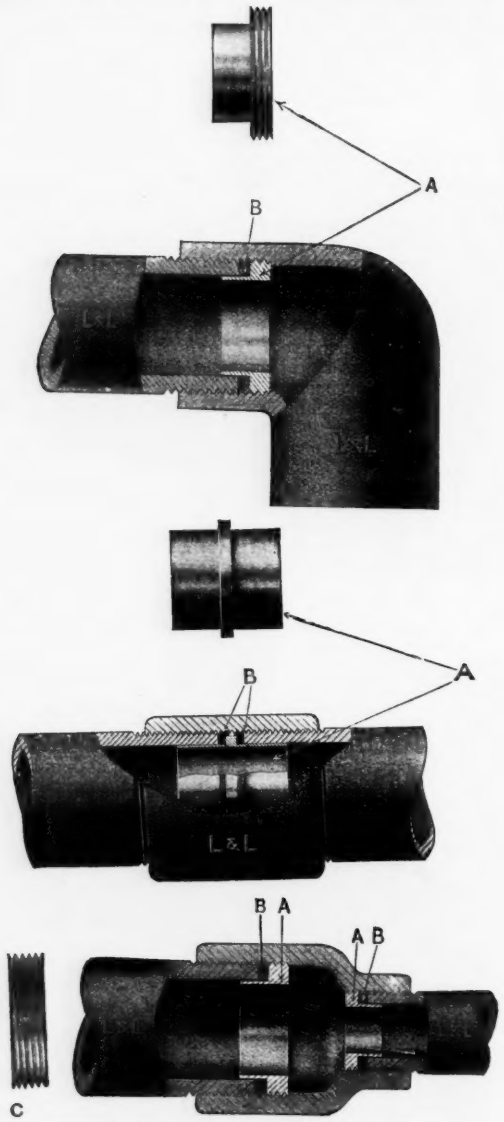
[The author then gave some particulars of mercurial governors, and the points to be considered in fixing them.]

To leather diaphragm governors, but few of the preceding remarks apply, as to a great extent their action is purely a mechanical one, and due to the action of the pressure upon the working parts. To the leather diaphragm, particular attention must be paid, or the resultant experiences will not be very happy ones. The leather will crack or perish, and the pins become wedged, thus holding up the valve, and putting the governor out of action. Much depends with diaphragm governors on their design, the quality of the leather, and the proper dressing of same with pure almond oil, castor oil, or a combination of pure first-class oils. Olive oil, or any common vegetable oil, hardens and destroys the leather. Leather diaphragm governors procured from makers of repute are satisfactory; but never fix a governor which is of a doubtful origin, unless you have a written guarantee as to the dressing of the leather diaphragm.

In Birmingham, as the main pressure is equal to 12 lbs. per square inch, we use a leather diaphragm governor for the purpose of breaking-down the pressure to about 2 lbs. for lighting supplies. The governor patented by Mr. A. J. Short, and recently acquired by Messrs. Parkinson and W. & B. Cowan has given excellent results. [An illustrated abstract of the patent specification was given in the "JOURNAL" for June 4 last year, p. 657.] The action of the governor is twofold, inasmuch as, in addition to governing the pressure, it acts as a safety-valve. The advantage of having a contrivance acting as a safety-valve, connected directly to the main, cannot be overestimated. Accidents cannot be prevented. A lamp may be knocked down by a motor-van skidding, a ladder falling, a runaway horse and van, and in innumerable ways; also in a factory or shop a pipe may be broken, or during alterations inadvertently left open. But with the safety contrivance, we need have no fear of accidents happening.

THE "BARRETT" JOINT.

Consequent upon the necessity for working with gas at extremely high pressure, a difficulty has been experienced with screwed joints to keep them gas-tight. All kinds of jointing cement have been used, each meeting with only a modicum of success. While the majority were experimenting with different chemical cements —such as manganesite, graphite, red and white lead, gold size, &c.—it was found necessary to go a step further, and be quite independent of jointing cements. Thus the "Barrett" joint, as now on the market, was designed. This joint allows us to make an absolutely tight junction between ordinary screwed joints.



Barrett's Patent Arrangement for Pipe Couplings.

In screwing up the joint, rings are crushed and squeezed together on the ends of the pipes, in such a manner that the joint is the strongest part of the pipe. The screwed thread is used only to draw the two pipes together. Either lead washers, or washers of other material are used. When lead is used, the lead and iron become so closely welded together by pressure that an escape is impossible, and the washer cannot be crushed out so as to obstruct the gas way.

The joint has passed the experimental stage, for it is now used under regular town pressure of 15 lbs. per square inch for gas services for the Corporation of Birmingham, and has withstood a 24 hours' test under water of 1000 lbs. air pressure (70 atmospheres), and hydraulic pressure tests up to 7000 lbs. per square inch. In a number of high-pressure installations just recently, working with pressures ranging from 2 lbs. to 14 lbs., we have had excellent results. As a matter of fact, quite lately I saw a test made upon 3000 feet of tube and fittings with 30 lbs. air pressure; and there was not a single leak.

There is only one factor to be borne in mind—viz., upon no account must the piping or fittings be unscrewed. If the correct position has been passed, a complete turn must be made. This can be readily understood; for it is the maximum ultimate pressure that is required. If the fitters chalk or mark fittings before the final turn is given, no difficulty can be experienced.

The invention consists of a brass or iron connecting piece in the centre of which is a raised fixed collar A. On each side of this collar a lead joint-ring B is placed. When the pipes are screwed into the socket, the joint-rings (compressed between the ends of the tube and the collar on the connecting-piece) are forced into the threads of the socket, thereby effecting a perfectly tight connection of great efficiency. In cases where the special ferrule is not obtainable, a small piece of nippling C should be inserted in the fitting, and the joint completed with the ordinary Barrett ferrule for tubes. Where the ends of the tubing are very irregular, two washers should be used. The diagrams show the method of using the "Barrett" joint for elbows, sockets, and diminishing sockets.

HIGH-PRESSURE METERS.

The fixing of high-pressure gas-meters is very important, on account of their great weight, and the necessity for absolute soundness. A meter well fixed, and fittings thoroughly tested, prevent serious escapes which may be followed by disastrous results. People now-a-days are so familiar with gas, from habitual use, that they are prone to use it without thinking, taking no notice of a slight escape. Never run any risks with an escape of gas. If there is ever such a slight escape, do not leave it to chance—make the defect sound. Nearly right is not good enough; it must be perfectly tight.

When deciding as to the position with regard to the fixing of meters, both of the wet and dry patterns, the following details must be rigidly adhered to. The main cock or valve should be readily accessible to the consumer, for easy access in cases of emergency. The meter inspector should be able to waterline the meter easily, and have ready access to the plug. All meters should be fixed in a position where the temperature is equable—or, in other words, where there is no very great variation in temperature. Do not fix any meters adjacent to hot-water pipes or sectional boilers; neither should they be fixed in exposed positions, where there is a likelihood of freezing. Water readily absorbs heat; consequently the water-line is lowered by evaporation, thereby causing slow registration. Keep all meters out of draughts.

If a dry meter is fixed in close proximity to heat, the leather diaphragms will eventually crack, and the valves or the working parts of the meter stick. Always have meters ample in size for any demand that may be made upon them. Otherwise, with wet meters, the drum, by rotating too rapidly, disturbs the water. This creates a corresponding disturbance in the water-line, thus interfering with accurate registration. Do not finish fixing a meter until the service-pipe is laid. Service layers may connect the inlet; and the gas supply may be turned on to unsound fittings. Dry meters should be fixed clear of the floor, and never with the back of the meter-case touching an outside wall. This causes the cases to rust very quickly, and may lead to a serious escape—an escape, moreover, which is very difficult to locate. Wet meters are reliable for large and variable consumptions.

All meters should be fixed on a firm, substantial base—brick or concrete for preference, on account of their great weight. High-pressure wet meters must never be fixed on wooden floors. Cylindrical meters require a special base or bed, which should be made of either brick or concrete; the sides being built up after the meter is fixed, to prevent rocking or any alteration in the position of the meter. Cylindrical meters are to be preferred without the cast-iron cradle and feet, as the weight is then distributed more evenly.

If the floor is very poor—being composed of sand, dirt, or loose rubble—have a good concrete base, excavate the ground to the required depth, and fill-in with concrete to the floor-level, keying the top of the concrete. Allow the bed two or three days to set before fixing the meter. It is absolutely necessary to have a solid base for all meters, large and small, and that the base be firm and strong, with no likelihood of subsidence; for every meter must be dead-level and remain so, in order to ensure accurate registration and prevent leakage.

There is one point in connection with the concrete. Insist on having the substance of the concrete passed through a 1-inch mesh or thereabouts. People may use old bricks and large clinkers for small layers of concrete. Such materials weaken the bed—rendering the base friable, and defeating its object. Vibration, too, should be avoided. Cases have been known where excessive vibration has loosened meter-connections and caused an escape of gas.

Arrange to have all high-pressure meters fixed adjacent to the boundary wall of buildings. Ungoverned service-pipes should

never be laid on private property, unless accessible, and in full view of both the consumer and supplier.

Iron and brass only should be used for connections. Thoroughly clean fittings before fixing; and grease the working joints. Beeswax, tallow, and blacklead makes a good lubricant. Fix a syphon near the outlet of dry meters. Interposing the tee and length of syphon tube have a high-pressure cock on the end of the syphon, an elbow, with an iron plug. The water may be drained away at any time the gas is being used, by turning off the cock and unscrewing the plug. All fittings must fit and work accurately. There must be no spring on the flanges and valves, as tension means an escape in the near future.

Flange joints may be made in several ways, all efficacious. Asbestos millboards may be used, well saturated with boiled oil and red lead paint, allowing ⅛-inch clearance all round. For very high-pressure flange joints, a good material to use is Klingerite. High-pressure gas is not likely to have any cutting effect on asbestos or asbestos cement joints, because they are compressed by the screwing-up of the nuts and bolts to such an extent that the jointing materials are made impenetrable. Taylor's copper rings, with the ridges filled with manganezite, are excellent for underground work, providing solvene is not a constituent of the gas. If such is the case, litharge may be employed; but it is better practice to test before using the different jointing cements with the particular kind of gas made in the locality.

The author then remarked that low-pressure meters, if made structurally strong to withstand the higher pressures, could be utilized for the measurement of high-pressure gas, providing they were suitably calibrated for the differential volume, consequent upon the increased pressure; and he went on to describe various meters designed for the registration of high-pressure gas—the Gas-Meter Company's double-index form, and the Parkinson and W. & B. Cowan patterns (which are used in Birmingham at the present time), with a detailed description of their patent aneroid compensating mechanism.

(To be continued.)

The "Electrician" Electrical Trades Directory.

We have received from the "Electrician" Printing and Publishing Company, Limited, Salisbury Court, E.C., a copy of the thirty-first annual edition of the above-named Directory, which is familiarly known as the "Big Blue Book." It is published towards the end of February, and its contents (occupying upwards of 2200 pages) are corrected up to the latest possible moment. The law of electric lighting, &c., is fully dealt with; and a digest, specially prepared by Mr. A. C. Curtis-Hayward, A.I.E.E., solicitor, is given. The principal legal decisions in 1912 affecting the electrical industry are included. Full financial details in regard to electrical joint-stock enterprise, and ample information relating to the financial side of every branch of the electrical industry, will be found, including a directory of directors of electrical companies, particulars of the capital authorized and issued, the last dividends paid, latest Stock Exchange quotations, lists of the chief officials, &c.; also the principal issues of capital made and the electrical and allied companies wound-up last year. The directory division contains the names and addresses of practically all persons engaged in the electrical profession and industry throughout the United Kingdom, with their telephone numbers and telegraphic addresses; and a separate list of telegraphic addresses (alphabetically arranged) is included. A graphic survey of the engineering and electrical equipment of all the electricity supply, electric power, and electric traction undertakings of the kingdom is given in the form of a number of compact tables.

Abstracts of Papers on Lighting Subjects.

The Physical Laboratory of the National Electric Lamp Association of America, the Director of which is Dr. E. P. Hyde, was organized in the autumn of 1908 for the development of those branches of science with which the art of lighting is closely associated. Up to the present time, sections in physics, physiology, and psychology have been organized. The results of the investigations carried out have been presented before the various scientific and technical societies of the United States, and have been published in the proceedings of these societies and in the recognized scientific and technical journals of America and Europe. It was, however, considered unwise to restrict the publication of these investigations to a new journal issued by the laboratory, or to reproduce in it the papers in full; and yet it seemed advisable that the complete work of the laboratory should be collated in such a way as to render it available to all who might be interested. To this end an "Abstract Bulletin" is being published; and we have received a copy of it from Dr. Hyde. It contains abstracts of 28 different papers, representing the original work carried out in the laboratory from its inception to the summer of last year. The abstracts, which are written by the authors of the papers, are fully illustrated with photographs and drawings, in the hope that to all except those specially interested in the details of the investigation they may be satisfactory substitutes for the original communications. Subsequent numbers will be issued as the further accumulation of published investigations may warrant. We may mention that Dr. Hyde is Chairman of the Photometric Committee of the American Gas Institute, and a Past-President of the Illuminating Engineering Society of America.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Abandoned Coal Export Tax.

SIR,—I rub my eyes in wonderment as to whether I am awake when I read your correspondent "Coal Fitter's" suggestion that no combination could exist among colliery owners to determine prices.

Can it only be by a series of accidental circumstances that for a million odd tons of coal lately purchased in various lots from half-a-dozen different gentlemen, we have had to pay the same increase of price to each?

Or is it that "Coal Fitter" is merely a *nom de plume* for some thick-and-thin supporter of the Government who knows the coal market only by hearsay?

My complaint was that when the great strike came to an end, we had no statesman at the helm to say "Britain's needs first! Foreign countries afterwards!"

I expressed surprise that the coal-tax was ever removed, and am told that it drove foreign buyers to other markets. Yet the foreigner is paying 50 per cent. more for the coal he buys to-day than he paid when the tax was in force. In 1906, the largest increase in the tonnage of exported coal is recorded, yet the following year the tax was removed because it restricted our markets!

The great Lord Shaftesbury said of Mr. Gladstone that while the miseries of the Bulgarians inspired in him a passionate eloquence, he gave no help or encouragement to Lord Shaftesbury's endeavours to ameliorate the lot of women pushing coal trucks in a coal mine.

Our Government turned a deaf ear to the needs of British industries, standing by cold and unmoved while coal poured out to all parts of the Continent.

Perhaps, now that our good neighbours the French have placed a tax upon exported coal, our legislators may not be above taking a leaf out of their book, as they have done from Germany with regard to National Health.

CHARLES CARPENTER.

South Metropolitan Gas Company, March 17, 1913.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

The Third Session of the First Parliament of the present King was opened by His Majesty on Monday last week, when, as customary, he read the Speech from the Throne. The Chairman of Ways and Means (Right Hon. J. H. Whitley) reported that, in accordance with the Standing Order, he had conferred with the Chairman of Committees of the House of Lords (the Earl of Donoughmore) for the purpose of determining in which House the respective Private Bills should be first considered. They decided that the following Bills should originate in the Upper House:—

Aberystwyth Corporation Bill, Bradford Corporation Bill, Broadstairs and St. Peter's Urban District Council Bill, Ebbw Vale Water Bill, Ely Valley Gas and Electricity Bill, Grays and Tilbury Gas Bill, Huddersfield Corporation Bill, Leeds Corporation Bill, Leicester Corporation Bill, Llantrisant Gas Bill, Metropolitan Water Board Bill, Morley Corporation Bill, Northampton Corporation Water Bill, Porthcawl and District Gas and Electricity Bill, Redcar, Coatham, Marske, and Saltburn Gas Bill, Rochford Rural District Council Bill, Slough Gas Bill, South Staffordshire Mond Gas Bill, South Staffordshire Water Bill, Tynemouth Gas Bill, United District Gas Bill, West Hampshire Water Bill, Worthing Gas Bill.

All these Bills have been presented and read the first time.

The following Bills have been presented and read the first time in the House of Commons.

Barry Urban District Council Bill, Bishop's Waltham Water Bill, Blyth and Cowpen Gas Bill, Bournemouth Gas and Water Bill, Brumby and Frodingham Urban District Council Bill, Coventry Corporation Bill, Crowborough District Gas and Electricity Bill, Derby Corporation Bill, Harrow and Stanmore Gas Bill, Heathfield and District Water Bill, Herne Bay Gas and Electricity Bill, Liverpool Corporation Bill, Lymm Urban District Council Bill, Mid Kent and East Kent District Water Bill, Mynyddislwyn Urban District Council Bill, Pontypridd and Rhondda Joint Water Board Bill, Swanage Urban District Water Bill, Titchfield District Gas Bill, Tottenham and Edmonton Gas Bill, West Bromwich Corporation Bill, Westgate and Birchington Gas and Electricity Bill, York Corporation Bill.

Petitions against Private Bills.

Petitions have been presented against the following Bills:—

LORDS' BILLS.

Bradford Corporation Bill, by the West Riding County Council, the Birstall, Cleckheaton, Farsley, Gomersal, and Shelf Urban District Councils, the Keighley and Skipton Rural District Council, and the Shelf Water Company.

Broadstairs and St. Peter's Urban District Council Bill, by the Margate Corporation.

Ebbw Vale Water Bill, by the Usk Board of Conservators.

Ely Valley Gas and Electricity Bill, by the Llandaff and Dinas Powis and the Llantrisant and Llantwit Fardre Rural District Councils, the Llantrisant Gas Company, Limited, the South Wales

Electrical Power Distribution Company, and the Treforest Electrical Consumers' Company, Limited.

Grays and Tilbury Gas Bill, by the Port of London Authority, the Essex County Council, the Billericay, Rochford, Chelmsford, and Maldon Rural District Councils, and the Southend Gas and Water Companies.

Leicester Corporation Bill, by the Leicestershire County Council.

Llantrisant Gas Bill, by the Pontypridd Urban District Council, the Llantrisant and Llantwit Fardre Rural District Council, and the Promoters of the Ely Valley Gas and Electricity Bill.

Metropolitan Water Board Bill, by the Conservators of the Thames; the Port of London Authority; the Essex, London, and Middlesex County Councils; the Croydon, Ealing, East Ham, Hornsey, Kingston-on-Thames, London, and Wimbledon Corporations; the Battersea, Bermondsey, Camberwell, Hackney, Hampstead, Kensington, Lewisham, St. Marylebone, Shoreditch, Southwark, Stepney, Stoke Newington, Wandsworth, and Woolwich Borough Councils; the Brentford, Greenford, Hampton, Heston and Isleworth, Leyton, Maldens and Coombe, Merton, Molesey (East and West), Southgate, Sunbury-on-Thames, Surbiton, Teddington, Tottenham, Twickenham, Walton-on-Thames, Willesden, and Wood Green Urban District Councils; the Staines Rural District Council; and the Gaslight and Coke and Brentford Gas Companies.

Morley Corporation Bill, by the West Riding County Council, the Wakefield Corporation, and the East and West Ardsley and Stanley Urban District Councils.

Porthcawl and District Gas and Electricity Bill, by the Porthcawl Urban District Council.

Redcar, Coatham, Marske, and Saltburn Gas Bill, by the Redcar Urban District Council.

Rochford Rural District Council Bill, by the Port of London Authority, the Essex County Council, the Rochford Parish Council, and the Overseers of Rochford.

Slough Gas Bill, by the Slough Urban District Council and the Eton Rural District Council.

South Staffordshire Mond Gas Bill, by the Walsall and Wednesbury Corporations, the Tipton Urban District Council, and the Halesowen Rural District Council.

South Staffordshire Water Bill, by the Birmingham and Sutton Coldfield Corporations and the Birmingham, Tame, and Rea District Drainage Board.

Tynemouth Gas Bill, by the Tynemouth Corporation and the Whitley and Monkseaton Urban District Council.

United District Gas Bill, by the Daventry Rural District Council.

West Hampshire Water Bill, by the Bournemouth Corporation.

Worthing Gas Bill, by Paul Ernest Schweder.

COMMONS' BILLS.

Barry Urban District Council Bill, by the Llandaff and Dinas Powis Rural District Council and the Pontypridd and Rhondda Joint Water Board.

Bishop's Waltham Water Bill, by the Droxford Rural District Council.

Blyth and Cowpen Gas Bill, by the Bedlingtonshire Urban District Council.

Bournemouth Gas and Water Bill, by the Bournemouth Corporation and Wimborne Minster Urban District Council.

Brumby and Frodingham Urban District Council Bill, by the Scunthorpe Urban District Council, the Frodingham Iron and Steel Company, and others.

Coventry Corporation Bill, by the Warwickshire County Council.

Crowborough District Gas and Electricity Bill, by the East Sussex County Council.

Derby Corporation Bill, by the Derby Gas Company.

Heathfield and District Water Bill, by the East Sussex County Council and the Ticehurst and Uckfield Rural District Councils.

Lymm Urban District Council Bill, by the Cheshire County Council.

Mid Kent and East Kent District Water Bill, by the East and West Ashford, Bridge, Hollingbourne, and Maidstone Rural District Councils, the Maidstone Board of Guardians, and the Canterbury Gas and Water Company.

Pontypridd and Rhondda Joint Water Board Bill, by the Aberdare and Caerphilly Urban District Councils and the Llantrisant and Llantwit Fardre and Neath Rural District Councils.

Swanage Urban District Water Bill, by the Swanage Gas and Water Company.

Titchfield District Gas Bill, by the Gosport Gas Company.

Tottenham and Edmonton Gas Bill, by the Tottenham Urban District Council, the North Metropolitan Electric Power Supply Company, and the North Metropolitan Electrical Power Distribution Company.

Portsea Island Gas Company Summoned for Deficient Illuminating Power.

The Portsea Island Gas Company were defendants at the Portsmouth Borough Court last week in a suit instituted by the Corporation, who sought to recover damages for the supply by the Company in January last of gas which was below the 14-candle standard specified in their Provisional Order of 1882. Mr. G. Hammond Etherton, the Town Clerk, represented the Corporation; Mr. Bliss appeared for the defendants. The latter briefly stated that his clients had encountered serious difficulties in obtaining proper coal, owing to the strike of miners; and delays had also occurred in getting the required additional plant to meet the increased demands for gas. They did not, however, rely upon technicalities, and would rather deal with the matter in a broad-minded way. He must, however, observe that the fact of the Corporation bringing an action against the Company for not supplying gas of 14-candle power, when it had actually been proved to be 13·97-candle power, was straining the law almost to breaking-point. The Court found the charges proved; but, under the circumstances, they declined to impose any penalty, and ordered the defendants to merely pay 5s. towards the costs.

MISCELLANEOUS NEWS.

THE STRIKE OF GAS WORKERS AT LIVERPOOL.

Statements by the Men and the Company.

There was no change early last week in the position of affairs in regard to the strike of gas workers in Liverpool. As reported in the "JOURNAL" on Tuesday, the strike had extended to the Garston works. On the preceding day, Mr. J. R. Clynes, M.P., and Mr. W. Thorne, M.P., paid a visit to the city; and, after a prolonged conference with the local leaders of the men, a manifesto was issued, in the course of which the following statements were made:

"The immediate cause of the dispute was the reduction of the position of one of the gas workers from that of a stoker to that of a labourer; his wages thereby falling by 9s. per week. There are many other causes which preceded that of this stoker. For a considerable time the Union has been endeavouring to secure from the Gas Company opportunities of discussing wage claims and other grievances of the men, as well as the co-partnership imposed upon the men some time ago. The refusal of the Company to treat directly with the agents of the Union to arrange friendly discussion on these claims has, we think, provoked this strike. . . . This refusal on the part of the Company is regarded as a challenge to the Union, and it compelled us to face the situation, and assert the men's right to act through their Society. We have therefore decided to financially support the members of the Union, and to make grants of money to other men. It was also decided that Mr. Thorne and Mr. Clynes should send a communication to the Company expressing our attitude on this question. We are wishful there should be a discussion of the differences, as we do not desire the citizens of Liverpool should be made to suffer by a strike being prolonged which might be settled early."

In reply, the Gas Company issued on Tuesday the following statement, signed by the Chairman (Mr. H. Ward Deacon):

"On Oct. 13, 1912, a gas stoker was guilty of a serious breach of regulations, and the matter was dealt with by the Works Superintendent, who disrated the man by transferring him from the retort-house to the yard. The man did not make any complaint to the Engineer, but on Feb. 27, 1913, the Gas-Workers and General Labourers' Union requested the Engineer to look into the case. This was done, at an interview at Duke Street, on March 3, 1913, between the Engineer and the stoker. The man expressed himself satisfied to leave his case in the Engineer's hands; but upon returning to the works some of his fellow-workmen did not approve of, and would not allow, this course. They demanded of the Works Superintendent the man's immediate reinstatement, threw down their tools, and stopped work without giving any notice; and induced others to follow their example. Some broke their signed agreements; and, had not the great majority remained faithful, the city might have been left suddenly without a supply of gas. There was absolutely no dispute of any kind between the Company and its employees; and the striking of work without a moment's notice is, in the opinion of the Directors, fatal to the welfare, not merely of the Gas Company, but of the whole community. The course adopted by the men, however, now appears to be approved by the Council of the Gas Workers' Union.

"The co-partnership scheme was not 'imposed' upon the men, as stated by the Council of the Union. On the contrary, many of the men had asked for such a scheme; and when the Directors promoted it, they caused it to be absolutely clear that the signing of the co-partnership agreements was to be a perfectly voluntary act on the part of the men. The men themselves know that this is a fact. It is by the men who are honourably carrying out their co-partnership agreements that the supply of gas is being maintained; and the Directors take this opportunity of expressing their great appreciation of the men's loyalty. The co-partnership scheme is managed by a Committee of 24 members, on which since the beginning there have been 18 members actually representative of the co-partners. The Chairman of the Company is *ex-officio* the Chairman of the Committee, and at the meetings opportunity is taken to discuss questions of wages and other matters of interest. Only last month the Directors received from the men at each of the works resolutions of thanks, because they had, after discussion with the Co-Partnership Committee, agreed, at considerable cost, to give a week's holiday each year, with pay, in lieu of the annual excursion. The Directors of the Gas Company are quite as anxious as the Council of the Union that there should be an early end to this trouble; but they cannot willingly run the risk of another sudden disturbance, and are therefore determined to support to the utmost of their power those men who believe in the co-partnership scheme, and who are now working to save it."

In reply to the statements issued by the Directors of the Company, the Gas Workers' Union sent the following communication: "Not one of our statements is upset by the reply of the Gas Company. It is true that the men struck work without notice, and they did so because they were exasperated by the Company's refusal to discuss the men's grievances, or consider the claims presented months ago by the Union. Men do not strike against kindnesses and benefits; and the Company cannot prove its case by refusing to meet the approved representatives of the men to discuss the trouble, precipitated by shutting the door on our approaches before and since the strike started. This is the second strike provoked by the terms of so-called co-partnership. The Company cannot ignore the men's Society, and stifle their appeals while calling them partners in their business. The Union did everything to avoid trouble; and we need not approve the stoppage to stand by men who are unjustly treated."

Address by the Engineer to the Co-Partners.

The following address to the co-partners in the Company, signed by the Engineer (Mr. Edward Allen), was posted at the various works: "The events of the past week so closely affect our common interest,

that I feel compelled to address you on the subject. While the case of Woods was the ostensible cause of the strike, it is quite certain that the object of the Gas Workers' Union is to damage, and if possible destroy, the co-partnership system at Liverpool. Such an attack is deeply resented by all of us; and almost every one of the 1756 members have volunteered for service at the works. Those who have accepted are efficiently doing what is required; and it is gratifying to know there is no danger of the Company failing in its obligations to the public. Although the number of those who have broken their agreements is very small in proportion to those who have kept their word and remained loyal, it is deeply regretted that any of our number should have failed to do so. It has not been found necessary to accept offers of assistance from other gas undertakings; and we look forward with confidence to a successful issue in this contest."

Settlement of the Strike.

The strike came to an abrupt conclusion on Thursday. A deputation of the men waited upon the Directors, and submitted the following questions: (1) If work be resumed, will Woods be restored to his place as a stoker? (2) Can arrangements be made between the representatives of the men and the employers to discuss the men's claims? The reply was to the following effect: The Company were willing to give employment to the men out on strike; but seeing that it would be impossible to find work for every man, a selection would be made by Mr. Allen (the Engineer). The case of the stoker Patrick Woods to be dealt with by the Engineer after a settlement of the dispute, when Woods might possibly be reinstated to his former position. The Company were not willing to deal with the officials of the Gas Workers' Union in regard to the rate of pay and conditions of employment. Rates of pay and conditions of labour to be referred to the Co-Partnership Committee in case of dispute. The strikers afterwards held a meeting, following which Mr. Clynes intimated that the men had unanimously resolved to resume work.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Reduced Price for Industrial Purposes.

The Annual General Meeting of the Company was held on Monday last week—Mr. WILSON MAPPIN (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts for the year ended the 31st of December, which were noticed in the "JOURNAL" for Feb. 18 (p. 475), said the result of the year's working had been satisfactory; the quantity of gas sold showing an increase of 243,968,000 cubic feet, or 6·13 per cent. This would, of course, have been larger but for the coal strike which occurred in March and April last. Prior to the strike—namely, for the months of January and February—there was an increase of 12·37 per cent.; but the whole of this was lost owing to the business of the city being paralyzed for want of fuel. It was, however, made up again in May and June; the total result on the first half of the year being an increase in sales of 2·23 per cent. This was followed by an increase of 10·59 per cent. in the six months from July to December; the result for the whole twelve months being 6·13 per cent. The stoppage of the pits naturally led to a scarcity of coal which, consequently, enabled colliery proprietors to advance their prices considerably. The Company fortunately had contracts running which carried them on to the end of August; otherwise the effect on the year's accounts would have been much greater, and instead of having a surplus to carry forward there would have been a deficiency. The actual increased expenditure on coal during the twelve months was £33,058. As against this, the gas sold showed an increase of £2078, which would have been considerably more but for the fact of the price having been reduced by 1d. per 1000 cubic feet from Sept. 1, 1911. Meter and stove rents were £750 more, coke (which fetched good prices during the strike) £23,249 more, tar £5321 more, and sulphate of ammonia £1031 more—the net result being a surplus of £10,100 after paying the dividend. The total number of meters now fixed was 102,823; the increase during the year having been 1785. The number of gas-fires sold had been 2263, boiling, heating, and other stoves 2406, and incandescent burners 22,294; while 734 additional cooking-stoves had been let on hire. Then 80 gas-engines, varying in size from 1 to 300 H.P., and representing a total of 2602 H.P., had been fixed. The quantity of gas used by engines in 1912 was 557,824,000 cubic feet. He was pleased to say that the Company's business in furnaces showed considerable expansion; 98 having been fixed during the year, with a total hourly consumption of gas of 28,210 cubic feet. It was becoming recognized in nearly every trade in the town that gas was a suitable and convenient fuel for very many processes; and the Company, with a view to further encouraging its use, had made a reduction of 1d. per 1000 cubic feet in all cases where the consumption exceeded 500,000 cubic feet, or £31 5s. worth of gas per annum. In arriving at this, the total consumption on any one works, for whatever purpose the gas might be used, was reckoned in with the furnaces; so that it really amounted to the gas being supplied for this purpose at 1s. per 1000 cubic feet—an extremely low figure, which should be greatly appreciated by consumers. In addition to this, gas for engines had been reduced to 10d. per 1000 cubic feet, at which figure 5½ H.P. per hour might be obtained for 1d., which, he thought, would compare favourably with steam or any other method of producing power. The Corporation would also derive a benefit of about £800 per annum in the reduction on public lamps; and he would suggest that they should spend a portion at all events of this money in altering some of the older fashioned lamps into those of a newer type, such as were installed in Church Street and West Street, where they had a lamp giving an illumination of about 600 candles for a total cost of £3 6s. 1d. per annum. He would again call attention to the room in Commercial Street which had been fitted up with furnaces, where customers were at liberty to bring their own material and make experiments before ordering a furnace for their own works. There were now twenty experimental furnaces fixed, with a power-hammer, gas-compressor, air-blast, lifting tackle, and liquid accessories for hardening and tempering. It would therefore be seen that the Company had carried out this work in a very thorough manner; and the extended use of these furnaces and gas engines should have its effect in considerably reducing the evil for which Sheffield and other manufacturing towns were notorious—namely, smoke.

The report was adopted, and a dividend of 5 per cent. for the half year on the "A," "B," and "C" stocks was declared.

At a subsequent extraordinary meeting, the Directors were authorized to issue, at such times and in such manner as they may deem expedient, £105,000, representing part of the debenture stock authorized to be created by the Sheffield Gas Order, 1893, as amended by the Gas Order, 1910. The rate of interest in respect of this is to be 4 per cent. per annum. The Chairman explained that it was not intended to issue the whole of the amount in the near future.

The proceedings terminated with a vote of thanks to the Chairman, Directors, and staff.

GERMAN CONTINENTAL GAS COMPANY.

Annual Report and Accounts.

We have received a copy of the report and statement of accounts of the German Continental Gas Company for the year 1912, which will be submitted to the fifty-eighth annual general meeting of the Company, which is to be held at Dessau on Friday, the 28th inst.

The past year witnessed an increase of 6·09 per cent. in the output of gas, notwithstanding that on the 1st of April last the supply of gas to the Rheydt-Odenkirchen district was handed over to the Lower Rhenish Light and Power Works. The active propaganda on behalf of electricity and the special tariffs offered to consumers affected the sale of gas for lighting purposes; but any loss experienced on this account was more than compensated by the increase in the sale of gas for cooking and heating. The number of prepayment meters in use increased from 36,018 to 44,618. The total output of gas during the year was 92,883,805 cubic metres (about 3,280,284,280 cubic feet).

The total profit for the year was 4,449,219 marks (about £218,100). It is proposed to pay a dividend at the rate of 11 per cent. per annum, which is the same rate as for 1911; but the capital has in the meantime been increased by about £150,000 by an issue of new shares. The premium on the issue of these shares and the amount in excess of the book value obtained by the sale of some parcels of land have been added to the reserve funds. The reserve, redemption, and renewal funds now stand at a total of about £1,173,399, or not far short of the share capital of the Company.

Coal has been purchased at somewhat more favourable prices than in 1911; and the markets for coke, tar, and ammonia have been firm. The Company now receive a much larger sum than formerly by way of dividends on their holdings in various light and power undertakings, of which the chief is the Lower Rhenish Light and Power Works already referred to. The Company have subscribed half the share capital of £400,000 of this undertaking, which has obtained a fifty-years concession for the supply of gas and electricity in Rheydt and district. A year's experience of the working of this mixed industrial works, which aims at putting public and private interests on an equal footing, has been favourable, and similar arrangements are likely to be made in other districts. In future it will be the policy of the Company to endeavour to obtain concessions for the supply of both gas and electricity. Negotiations with the city of Odessa for the supply of gas have been concluded, and the agreement only awaits ratification at St. Petersburg. A large number of arrangements have been entered into for co-ordinating supplies of gas and electricity in districts in which the Company were already interested, with a view to avoiding competition of a harmful character.

The pension, widow, and orphan fund of the staff now has 308 subscribers, and closes the year with an increase of about £11,850 in its accumulated funds. The interest on the balances in public savings' banks to the credit of officials and workmen of the Company has been made up by the Company to 11 per cent.—*i.e.*, to the rate of dividend payable on the share capital.

Herr Bruns Heck, of Rheydt, has succeeded Herr W. von Oechelhaeuser, Hon. Doc. Eng., as General Manager of the Company. The Company now have seventeen works or undertakings, situated in thirteen different places. The number of places supplied with gas is 79, and with electricity seven.

ILFORD GAS COMPANY.

Projected Extensions at the Works—Co-Partnership Scheme.

According to the report presented at the recent half-yearly general meeting of this Company, there was an increase of 15,825,000 cubic feet, or 8 per cent., in the quantity of gas sold in the six months ended Dec. 31, compared with the corresponding period of 1911; and the sale of residuals produced an additional revenue of £770. The balance of the profit and loss account available for distribution was £23,173, out of which the Directors recommended a dividend for the half year at the rate of £7 12s. 6d. per cent. per annum on the "A" and "C" stocks, and £6 2s. 6d. per cent. per annum on the "B" stock, subject to the deduction of income-tax. The Chairman (Mr. W. Ashmole), in moving the adoption of the report, directed attention to the increased consumption of gas, and said the general working of the Company, as shown by the revenue account, was extremely good; the various items comparing very favourably indeed with the figures for the second half of the year 1911. Having given particulars of the amounts, the Chairman said he thought the shareholders would be satisfied the Company was progressing favourably, and that the outlook was bright, so far as increase and general conditions were concerned. There were, however, several features which would affect the future of the undertaking, among them being the high prices of coal and materials. It was to be hoped that these increases were only temporary, and that prices would revert to their former figures, or at

least be considerably reduced, in course of time. With regard to the works themselves, some minor improvements had been carried out, and a scheme was under consideration for future extensions to meet the general growth of the neighbourhood and the increased consumption of gas. It included a new sulphate of ammonia plant and house, new purifiers, breeze-washing plant, extensions to the retort-settings, coke-breaking plant and storage-hoppers, new cooker-cleaning shop, gas-fitters' workshop, and a few minor alterations. These extensions would not be all made at one time, but would probably be spread over the next few years, so that the cost would not be greatly felt.

Mr. Soutter, in seconding the motion, referred to the growing increase in the price of coal, and said he thought steps ought to be taken by all concerned to prevent the present enormous export of coal to enrich other countries at our expense. He considered that the Government should be urged to impose an export tax, and a high one; and he inquired whether the Directors could co-operate with other bodies to bring pressure upon the authorities in this matter. The Chairman said he quite agreed that taxation was the only thing to do.

The report was adopted, and the dividend recommended declared. The retiring Directors and Auditor having been re-elected, a vote of thanks was accorded to the Board for their efficient management of the Company's affairs during the year. The Chairman acknowledged it, and proposed a similar vote to the staff and workmen. The Engineer and Manager (Mr. W. B. Farquhar) and the Secretary (Mr. Gerald H. S. Iorns) responded.

In his reply, Mr. Iorns gave a few particulars in regard to the Company's co-partnership scheme, which, not being a part of the Company's business, was, he said, little heard of at the meetings. He stated that the scheme had been in operation for three-and-a-half years, and the number of co-partners was 159. During the past year they had received £721 in bonus; being 4½ per cent. on their wages. Since the scheme had been adopted, the co-partners had received a total amount of £2195. At a previous meeting, he asked if anybody would sell some stock to co-partners. He had now been able to purchase sufficient for all who were entitled to have a holding. Since profit-sharing had been in force, the price of gas had gone down 2d. per 1000 cubic feet. This enabled the stockholders to receive £740 in additional dividend, and the consumers had benefited to the extent of £5137. He thought these figures would show that everybody in the Company was interested in getting the price of gas down as low as was possible in order that they might all receive their bonus and the dividend on the stock they held at the highest possible rates.

WALTHAM ABBEY AND CHESHUNT GAS COMPANY.

The Chairman of the Waltham Abbey and Cheshunt Gas Company (Mr. Alfred Kitt, Assoc.M.Inst.C.E.) had some interesting particulars to communicate to the shareholders, in regard to the operations of the Company last year, on the occasion of the recent ordinary general meeting. The Directors' report showed a profit of £5584; and after payment of an interim dividend at the rate of 8½ per cent. per annum on the "A" shares and 6½ per cent. per annum on the "B," "C," and "D" shares for the six months ended the 30th of June, providing for the interest on the debenture stock and loans, and setting aside £580 for the renewal account, there remained a balance of £3408. Out of this, the Directors recommended the payment of dividends at the same rates as before, which would leave £965 to be carried forward. In moving the adoption of the report, the Chairman remarked that the results of the past year's working were interesting, and certainly most gratifying, notwithstanding the many difficulties the Directors had had to contend with. The price of gas had been reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet from the Lady-day quarter last year; and in spite of this, the increase in the gross revenue amounted to £1115, of which £510 was on gas sales, as they had sold 8·66 per cent. more gas during the year. With regard to residual products, the prices realized for coke showed an increased amount obtained per ton of coal of nearly 1s. 8d.—18s. 10d. against 17s. 2d. This was, no doubt, brought about by the coal strike. The gas made per ton of coal carbonized was 14,593 cubic feet, and the quantity sold 13,580 cubic feet. This was a record in the history of the Company. Having referred to the financial results of the year's working and the increased business, the Chairman said the sale of gas last year was 91 million cubic feet, and the capital employed per million was £925, which was below the average. He mentioned this as showing the stability of the Company, and its capability of meeting future requirements. In conclusion, Mr. Kitt said he wished to bear testimony to the very able and excellent management of their Secretary and Engineer (Mr. W. Bince Randall). Mr. Henry Woodall seconded the motion; and it was carried. The dividends recommended were declared, and the retiring Director (Mr. Kitt) and Auditor (Mr. W. M. Beck) were re-elected.

AUCKLAND (N.Z.) GAS COMPANY.

The Fifty-First Annual General Meeting of this Company was held at the Offices in Auckland on the 3rd ult.—Mr. J. H. Upton (the Chairman) presiding.

The report showed that the profits on the past year's working amounted to £48,277; and the Directors recommended a dividend for the half year of 1s. 10d. per share on the £1 fully-paid shares, and a proportionate dividend on the contributing shares, £1 paid—viz., on 17s. 6d. for the full period and on 2s. 6d. for a portion—amounting to £21,813. This added to the dividend paid in July last (£21,784) made £43,597; leaving a sum of £4680 to be added to the net revenue account.

The Chairman, in moving the adoption of the report and accounts, said the Directors again had the pleasure of showing the record of a prosperous year, with successful development in every direction. On the revenue side of the accounts, there was a total increase of £17,879, of which sales of gas represented £13,086 and residual products £5757. On the expenditure side, the total increase was £16,055, of which manufacture represented £11,401 and distribution £2805. The receipts amounted to £176,091, and the expenditure to £127,814; the balance of profit being £48,277. After payment of the dividend, which was £2151 more than last year, owing to increased capital expenditure, there remained a balance of £4680 to be carried to the net revenue account; making the balance at the credit of this account £32,634. The item of £6669 for rates and taxes was a large one, and was £1102 more than for 1911; and £954 of this was graduated land tax. The charge for rates and taxes was equal to 2½d. per 1000 cubic feet of gas sold. In this connection, it was desirable for the shareholders to bear in mind that the Electricity Department of the city was not debited with rates and taxes at all as an ordinary company would be. If the Company were in the same happy position as their electrical friends, they could, and should, make an immediate reduction in price of 3d. per 1000 cubic feet. The consumers had augmented in number by no less than 2053; the total being 23,793. Gas-stoves in use had increased by 1231—about four for every day in the year except Sundays. This was an eloquent testimony to the growing recognition of the great advantages of cooking by gas. The extension of mains went with the expansion of the business. The increase for the year was 32½ miles; making a total of 343½ miles of mains laid. The new gasholder of 2,300,000 cubic feet capacity would, the Directors hoped, be in use before next winter; and its assistance would be of great value in maintaining a full supply of gas over the Company's widely spread area of consumption. The maximum day's output last winter at the Beaumont Street works was 2,410,000 cubic feet, and was in advance of that of 1911 by 110,000 cubic feet. A similar increase might be looked for in the coming winter; but whereas the storage capacity was now only 1,500,000 cubic feet, in future it will be 3,800,000 cubic feet. A start had been made with the erection of the vertical-retort house. This house would, when completed, manufacture 1,500,000 cubic feet in 24 hours; and it was hoped that one or two settings of retorts would be ready for use in 1914. The Chairman mentioned that reductions had been made in two of the Company's districts—in one case of 5d. and in the other of 7d. per 1000 cubic feet. Having referred to the reconstruction of the Devonport works and the improvements effected at other stations, the Chairman announced that the employees had formed a Gas Workers' Provident Association, and had approached the Board with a proposal that special facilities should be afforded them for investment in the Company's shares. The proposal met with the Directors' entire sympathy; and they therefore decided to allot shares to the Association, registered in the names of Trustees, at a discount of 12½ per cent. from the market price at the date of purchase. This was equal to a bonus of 2s. 6d. for every 17s. 6d. contributed by the Association, and was a subvention of 14·3 per cent. on the capital invested. The action of the Board would, they did not doubt, meet with the shareholders' entire approval. The Chairman next dealt with a proposal to increase and rearrange the capital of the Company. He said he could not conclude his remarks on the year's work—showing, as it did, so much activity in both the engineering and mercantile departments, but especially in the former—without an acknowledgment of the energy and ability of the Engineer (Mr. James Lowe) and the Secretary (Mr. W. F. Stewart) and of the services of the staff of officers and employees generally, who had worked faithfully under their direction.

The report was adopted.

The retiring Directors and Auditors having been re-elected, thanks were accorded to the Directors and officers, and the proceedings of the ordinary meeting terminated.

A special meeting was then held at which it was decided to increase the capital of the Company to £750,000, by the creation of 250,000 new shares of £1 each, and to divide the existing £5 shares into five shares of £1 each.

TESTING AND FITTING GAS-FIRES.

In the Lesser City Hall, Glasgow, on Wednesday evening last, Councillor Irwin (the Sub-Convener of the Glasgow Corporation Gas Committee) presided over an audience of about 300 employees of the Glasgow Gas Department and outside traders. The occasion was a demonstration, by Mr. W. R. Twigg, of the Davis Gas Stove Company, Limited, of the "Shadowgraph" testing of gas-fires, which has been fully described in the "Journal." [See Vol. CXIX., p. 318, and Vol. CXX., p. 495.] The lecturer also dealt with the construction and fitting in of gas-fires.

The demonstration was highly appreciated by those present. At the close, questions were solicited. These dealt chiefly with the old trouble of down-draughts. One sound piece of advice given by the lecturer was that all fitters, before fixing a gas-fire, should inquire of the householder the action of the chimney where the fire had to be fitted. If this were done, many complaints might be averted, as proper precautions could be taken at the beginning to give good results.

Mr. R. Halkett, the Commercial Superintendent of the Distribution Department, referred to the rapid strides that have been made within recent years in the construction of gas-fires. It appeared to him that the aim of manufacturers in the past was to produce the most ornamental design possible, without due consideration to the efficiency of the fire. However, it was pleasing to note that the brick, fuel, and burner were points that were now being carefully reckoned with.

Mr. Alexander Wilson, the General Manager of the Department, in moving a vote of thanks to the Chairman, stated that while the duty of the gas-fitter was to see that a thoroughly satisfactory job was made in the fitting of the fire, yet those in charge of gas undertakings had also a very important duty to perform, and that was to see that only gas-fires of the best type were sent out to their customers.

The following evening, Mr. Twigg gave a demonstration in the Leith Walk Continuation School, Edinburgh, under the auspices of the Edinburgh and Leith Gas Commissioners. Mr. A. Masterton, the Gas Engineer and Manager, presided, and in the course of his introductory remarks commended the method of which Mr. Twigg was the exponent. He mentioned that this was the first time a demonstration had been given in the city, though the employees of the Gas Commission were using the principle in a modified form. Mr. Twigg's lecture was received with every mark of appreciation.

LEICESTER GAS UNDERTAKING.

The Use of Gas-Fires.

A large proportion of the time of a special meeting of the Leicester Town Council last Tuesday was occupied in the consideration of the report of the Gas Committee, which was submitted in two parts.

In presenting the first part, Alderman T. Smith, the Chairman of the Committee, pointed out that it referred to their ideas as to the best methods of developing the business. In the view of the Committee, the most likely source of new business was an extension of the use of gas for heating purposes, both domestic and industrial, as apart from cooking. After considering the question, the Committee recommended the Council to adopt a hire-purchase scheme for gas-fires based on a period of five years (the gas-fire becoming the property of the consumer at the end of this period), and to supply gas within the borough for the purpose at 2s. per 1000 feet. The cost of the fires would vary according to size. Fires would be fixed free and maintained for a period of five years by the department. It was proposed to invite the ironmongers and gas-fitters of the town to co-operate in popularizing the scheme and making it a success. The Committee had also arranged that the price of gas to any consumer within the borough using an average of 1½ million cubic feet per quarter during any one year for heating purposes industrially, apart from cooking, be reduced to 1s. 10d. per 1000 cubic feet. The business done by the gas-fitters and plumbers had been so infinitesimal that their loss by the adoption of the Committee's recommendation would not amount to much. For the future, the Committee proposed to make an allowance to the gas-fitters for work done under their supervision. This section of the report was adopted.

The Financial Statement.

Alderman Smith then proceeded to explain the second part of the report, which dealt with the financial affairs of the undertaking for the half year to Dec. 31. He said the net surplus, after paying interest on the capital of the undertaking, and after payment of the expense in respect of the new meters, was £21,630. After deducting the sum of £7337, being the half-yearly payment to the sinking fund, and a sum of £609 to the Public Works Loans Commissioners, a balance of £13,684 remained, which, added to the £30,791, the surplus for the half year ending June 30 last, made a total of £44,475 for disposal. At the request of the Finance Committee, a sum of £32,000 was estimated to be at their disposal in respect of the year 1912. When the scheme of vertical retorts was at first proposed, the Committee desired to discharge the expense out of the reserve fund. This was not consented to; but inasmuch as the retorts were replacing existing plant of the same capacity, and were an "extraordinary demand in respect of the undertaking," the Committee desired the Council to sanction payment for them out of the reserve fund, which now stood at £46,620. The Finance Committee had approached the Committee with a view to ascertain whether a greater sum than £32,000 could be appropriated for the purpose of rate assistance for the current financial year; and the Committee recommended that, if the before-mentioned suggestion with regard to the payment for the vertical retorts be approved by the Council, a sum of £7000 be carried forward to the renewals fund, and the balance of £37,475 paid to the district fund in respect of the last financial year, and that the renewals fund and the reserve fund be built up as rapidly as possible with a view to reconstruction of both works from these sources, so far as the latter fund was applicable. If no unforeseen contingencies arose, and if the markets for residual products remained as at present, the Committee were of opinion that it would be possible for 1d. to be taken off the price of gas to ordinary consumers within the borough, as from the end of September next; and they recommended accordingly. The balance carried forward to the profit and loss account showed an increase of nearly £1900; and, after providing for interest and sinking fund, and the payment of the cost of new meters from revenue under the terms of the Council's resolution, the profits for the whole year were £2000 less than for 1911. Not deducting the cost of meters, however, the profits showed a record for the undertaking—amounting to £52,759—and this notwithstanding the extra cost of coal and oil. This profit would not have been realized except for the fact that the department sold 116 million cubic feet more gas, which yielded a profit of about £5000. The residual products also realized some £11,300 more during the year. After some discussion, this portion of the report also was adopted.

ILKESTON GAS UNDERTAKING.

[From Our Local Correspondent.]

Following upon recent revelations regarding matters connected with the Ilkeston gas undertaking, a very unsettled feeling continues to be manifested in the Derbyshire borough. One outcome of the matter has been the demand that the responsible Committees of the Corporation might, upon important occasions, pay respect to the ratepayers by entrusting them with a larger degree of their confidence. It is complained that too much has been done in the past, and especially in relation to the gas undertaking, "behind closed doors." There is no attempt made now to disguise the fact that upon the occasion of the Local Government Board inquiry in 1898, when sanction was sought to borrow money for gas-works extension, the Inspectors sent down from London were in reality hoodwinked; no direct attention being called to the change of arrangements in regard to the new gasholder tank. The only suggestion by way of exculpation is that both sets of plans were on the table; but it is clear that the representatives of the Board had no reason to suppose that any other scheme was contemplated beyond that shown in the drawings that had been forwarded to London for their use, showing provision for a brick and puddle tank, the establishment of which would, there is no doubt, have obviated the element of danger entailed by the subsequent adoption of the above-ground steel tank. While the irritation resulting from recent disclosures has been by no means allayed, the necessity in the financial interest of the town of again placing the gas undertaking upon a remunerative working basis is being persistently enforced. Ilkeston is just now feeling the pinch of abnormally high rates, profits from the supply of gas having hitherto represented the only oasis in a desert of unremunerative municipal enterprise.

It was complained by Mr. R. G. Walters, at a meeting on Tuesday, that in the past the Council had left too much in the hands of officials; the recent Government inquiry, when revelations in relation to the gas undertaking were forthcoming, eliciting the fact that it was not until last year that the true state of the town's finances was known. Having in mind apparently the maladroit action of the Gas Committee, of which the late disclosures have afforded abundant evidence, another speaker declared that there was too much "tweedledee and tweedledum" about the methods of the Council—many matters being unnecessarily concealed from the burgesses. The rate at which loans have been piled up since the borough's incorporation a little more than twenty-five years ago is giving cause for serious reflection; and the only asset of any value being the gas undertaking, the fear is now not unnaturally being expressed that, in the attempt to replenish the municipal exchequer, there may be at Ilkeston—as has happened in much larger communities—an unfair incidence of the financial burden cast upon the shoulders of those who are consumers either for lighting or power purposes.

WEST BROMWICH PUBLIC LIGHTING.

Comparative Trials of Gas and Electricity.

Important tests of gas and electricity are now being made to enable the West Bromwich Town Council to decide which is the more efficient illuminant to permanently introduce into High Street. The Electricity Committee, who have hitherto had the lighting arrangements of the main thoroughfare in their hands, are making strenuous efforts to retain the business. They have introduced the latest type of German arc lamp, which they claim is capable of giving a light of 2000-candle power, and will be a cheaper illuminant than the present electric lamp, which only gives a light equal to 500-candle power. On the other hand, the Gas Committee are doing their best to induce the Corporation to change the system of lighting; and the Gas Engineer (Mr. Harold E. Copp) is making an excellent show with five high-pressure lamps of 1000-candle power each.

The Gas Committee contend that if the test was only one for the volume of light, they could easily have beaten the Electricity Committee by going to Germany and obtaining high-pressure lamps equal to anything up to 10,000-candle power. They do not feel that it is necessary to incur this expense, as they understand the test is not one in which the quantity of light is to be taken into account so much as its quality, and the illuminating efficiency that can be guaranteed. These being the conditions, the Gas Engineer has only erected lamps that will be capable of giving a really efficient light; and he contends that gas-lamps equal to 300 or 400 candle power would be ample for a satisfactory illumination of the High Street. The question of cost will be an important one for the Town Council to consider; and the Gas Committee claim that they can light the High Street much more cheaply and quite as effectively as the Electricity Committee. The test is creating a great deal of public interest.

QUALITY AND PRICE OF GAS AT SKEGNESS.

[From Our Local Correspondent.]

Trouble which has arisen at Skegness between the Urban District Council and the Gas Company has passed from a controversial to a more acute stage. Reprisals are threatened; the suggestion being seriously mooted at the meeting of the Council last Tuesday that Electric Light Companies should be invited to enter into negotiations with the Council with the object of undertaking the work of public illumination. Though a more pacific view of the situation ultimately prevailed, and definite action upon the line indicated was deferred, the discussion suggested the possibility of an important development of local policy, failing relief from the tension which exists. The trouble, now of somewhat long standing, had its origin in complaints of excessive prices and allegations as to the poor illuminating power of the gas—points in relation to which the Company joined direct issue with its critics. The supply, they contended, has been maintained at a minimum of working profit; while as to the character of the gas itself, the Company have manifested readiness to submit to accepted standards of test. Feeling on the question, which had previously not erred on the side of moderation, has been embittered by the reply of the Company to the Council's recent request for a reduction in price. Far from entertaining the idea of lowering the rate, or even being content to allow it to remain at its old level, the Company promptly gave notice of their intention to raise the price from 3s. 6d. to 3s. 9d. per 1000 cubic feet. The Council were irate; the Chairman contending that, in view of the good dividend which was being paid, the Company could well afford to reduce the price to 3s., as the Council had suggested. Mr. J. H. Shelley reiterated the complaint as to the poorness of the illuminating power of the gas—declaring that recent tests had shown it to be much below the required standard. He emphasized the consideration regarding the general dissatisfaction prevailing as to the nature of the supply and the price charged by the Gas Company, by suggesting that a town's meeting should be convened; and, in order to test the feeling of the Council, he moved the resolution as to an invitation being extended to Electric Lighting Companies to enter into negotiation. The proposal, however, was ultimately withdrawn, on the understanding that the Council should obtain an interview with the Company.

The Directors of the Bombay Gas Company, Limited, have declared a dividend at the rate of 4½ per cent. (less tax) for the six months ended Dec. 31; making 7½ per cent. for the year.

POINTS UNDER THE HEALTH INSURANCE ACT.

Contributions for Workmen Absent through Sickness.

Mr. R. W. Edwards, the General Manager and Secretary of the Aldershot Gas, Water, and District Lighting Company, has forwarded copies of letters that have lately passed between him and the National Health Insurance Commission on certain points on which he required information. Their nature is apparent from what follows.

Early in the year, Mr. Edwards submitted to the Commission the case of a man employed at the water-works who was absent on account of sickness, but in receipt of an allowance from the Company; and he asked to be informed whether the Company were liable to contribute under Part I. of the Insurance Act in respect of this man during the period he was away. He also wished to know whether the Company were liable in respect of workmen away through injury, but in receipt of allowances under the Workmen's Compensation Act, 1906.

To this letter he received a reply to the effect that while an employee is disabled, and in receipt of a weekly sum under the Workmen's Compensation Act, neither he nor his employer is under any obligation to pay contributions under the National Insurance Act, unless wages are paid in addition to the compensation. He was further informed that during periods for which no employer is liable, a contributor, who is normally an employed person, may, if he wishes, pay the whole contribution himself, in order to avoid postponement or reduction of benefits. The weekly contribution thus payable will ordinarily be 7d. in the case of a man and 6d. in the case of a woman. In regard to Mr. Edwards's first question, he was told that if the allowance was of the nature of remuneration, and not of compensation or a gratuity, the usual contributions were payable in respect of the absent man.

Thereupon Mr. Edwards wrote to the Commissioners and asked them to reconsider their decision. He pointed out that the opinion contained in the first edition of Mr. Orme Clarke's standard work on the National Insurance Act, 1911 (p. 36), on Section 4 of Part I., is as follows: "... (*b*) renders no services and has been in receipt of sickness or disablement benefit during any week, no contribution is payable either by the employer or by the employed contributor. Thus no contribution will be payable where the employee is away from work ill, notwithstanding that his contract of service subsists, whether he is or is not in receipt of remuneration." As this opinion was so entirely in contradistinction to that contained in the Commissioners' letter, Mr. Edwards said he should much esteem a further ruling on the points originally submitted by him.

The response to this request was brief, and to the effect that "if an employee has rendered no services during any week, and has been in receipt of sickness benefit or disablement benefit during the whole or any part of that week, the employer is not liable to pay any contribution in respect of that week, although the employee is in receipt of remuneration."

COAL PRICES.

[From the "Iron and Coal Trades Review," March 14.]

It is perhaps an unconscious tribute to the position of the coal industry, as the parent industry of practically all others, that when the price of coal advances more complaints are heard than when any similar development takes place in connection with commodities of a different character, which are not in such universal demand. At the same time, it must be remembered that wages have to be paid always, and dividends distributed when possible, even in the coal-mining industry, which, while it is the acknowledged basis of the world's manufactures and commerce generally, is not a philanthropic institution. Moreover, when the price of coal goes up, it means that trade is good all round, and that consumers are getting a remunerative price for their own wares. Indeed, it is only when the consuming industries have been busier than usual for some time, and have already increased their profits, that coal begins to feel the increased demand and becomes dearer. So that there is rather less reason to grumble at an advance in the price of this commodity than there is in the case of others. Too pronounced a rise, of course, would speedily check general trade developments by unduly increasing the cost of production; but such matters are speedily adjusted by the usual economic forces. The law of supply and demand does not change.

Among the consumers who have least cause of complaint concerning the advance in the price of coal are the gas companies; and, they, of course, are having more to say on the subject than anybody else. The Chairmen of both the Gaslight and Coke Company and the South Metropolitan Gas Company have been eloquent upon the question—apparently forgetting the long periods during which they have been supplied at cost or little more, and the fact that their sales of coke and bye-products alone bring them in revenue which practically pays their coal bill, and enables them to obtain their gas for next to nothing. But in any case they are agreed that the rapacious coal-owner must be circumvented; and, great minds thinking alike, they have both hit upon the same scheme for attaining that end. Unfortunately, it has not even the merit of novelty. It is nothing more or less than a revival of the export coal-tax, which was abandoned as a failure some years ago by a Government by no means overwhelmed with revenue. Something of the kind has been suggested occasionally since then; but the proposal has met with no encouragement hitherto, and it is hardly likely that it will now. Indeed, the two gentlemen who now advance the scheme as a means for keeping prices down seem somewhat at variance as to its effects, even if it were adopted.

Sir Corbet Woodall believes that it would check exports, throw more coal upon the home market, and so lower prices; and his position is at least explicable. But Mr. Charles Carpenter expresses the belief that even 2s. 6d. per ton duty would not affect the volume of our exports; and this being the case, it is difficult to discover why he is in favour of such a tax, or how it would benefit the gas industry. And even supposing that an export duty did affect home prices, why should the Government be called upon to take action in order to further enrich a particular and already prosperous industry—one, indeed, which has done remarkably well, notwithstanding the higher prices it has had to pay for supplies of coal? When the export tax on coal was imposed, the object was to increase the national revenue for general purposes, and not to assist particular trades, although whether it did that incidentally is another question, which we are inclined to answer in the negative. In any case, we do not think that, upon an examination of the facts, the price of coal has risen more than is warranted by the extra cost of production, arising from new legislation and higher wages and the expansion of the demand resulting from the improvement in trade both at home and abroad. The increase in the cost of production is virtually permanent, we are afraid; but if, as seems probable, we have now seen the best of the general trade "boom," it will not be long before coal prices feel the effect. Whatever may happen, however, it would be the height of folly to tamper with our export trade, especially at a time when German competition on the Continent is keener than ever, and when the Americans are paying more attention to foreign markets than they ever did before.

THE ELECTRIC MEAT-SHRINKAGE FICTION.

In the "East Anglian Times" recently, there appeared a paragraph referring to the old fable of electrical origin that by baking meat in an electric-cooker, there was a great saving of meat compared with cooking in a gas-oven. Mr. W. M. Mason, the Secretary of the British Commercial Gas Association, has written as follows to the Editor:

The oft-refuted mis-statement that there is more wastage in meat when cooked by gas than by electricity is contrary to fact, as the "supposed" saving is simply a retention of moisture. If it is desired to cook meat in such a way as to retain within the joint the maximum amount of water contained in raw meat, this can be effected as fully and as easily in a gas-oven as in an electric-oven, at less than one-fourth of the cost, with electricity at only 1d. per unit. If it is desired to cook the meat more thoroughly—that is, to expel a large quantity of moisture—this can be done easily in a gas-oven; but to produce the same result in an electric-oven the period of cooking must be prolonged to an inconvenient length. This is due to the fact that the atmosphere in an electric-oven remains moist through deficient ventilation.

The following results were recently obtained after careful tests: Two legs of lamb, each weighing 76 oz. before cooking: Loss in weight after cooking by electricity, 17·1 per cent.; dripping recovered, 5·9 per cent.; net loss, 11·2 per cent. Loss in weight after cooking by gas, 15·2 per cent.; dripping recovered, 5·9 per cent.; net loss, 9 3 per cent. Cost of electricity (at 1¾d. per unit), equals 3¼d. Cost of gas used (at 2s. 6d. per 1000 cubic feet), equals 0·42d. Electricity therefore costs nearly eight times as much as gas. The gas-stove took one-and-a-half hours to do the work, and the electrical cooker two-and-a-quarter hours.

The practical experience of consumers who have tried both systems confirms these figures. Electricity cannot compete with gas for cooking until (*a*) it can be supplied at ¼d. per unit; (*b*) the cost of the apparatus and fixing can be reduced to one-fourth its present cost; (*c*) the apparatus can be made reliable and easy to keep in repair at a low cost.

EARLY GAS SUPPLY IN LANARKSHIRE.

The attention of a contributor to the "JOURNAL" has lately been called to some paragraphs bearing upon gas supply in Lanarkshire, contained in a book published in 1841, entitled "The Statistical Account of Lanarkshire," compiled "by the Ministers of the Respective Parishes for the Benefit of the Sons and Daughters of the Clergy." He has had the paragraphs copied, and they are reproduced below.

A Company for lighting Glasgow with gas was incorporated by Act of Parliament in 1817, with a capital of £40,000, which has been increased from time to time to £150,000. The first street lamp was lighted with gas on the 5th of September, 1818. The works are on a large scale, and, including subsidiary establishments in different parts of the town, occupy an area of 14,831 square yards. The principal establishment now forms a square, of which one side is occupied by retorts, condensers, and other apparatus; and round the other there are arranged sheds, under which cannel coals are stored, to preserve them from moisture. These sheds are calculated to contain 6000 tons; and to show at any time how much coal is on hand, they are divided into compartments, each containing a certain known quantity. The Company have at present 152 retorts, each capable of making 5000 cubic feet of gas in 24 hours. Of these, 105 are required in winter, and 30 in summer.

The gasholders are of a very large size, and are eight in number—viz., four at the works, and four in different parts of the town. By this arrangement, the pressure of gas is equalized in all portions of the city and suburbs. Cast-iron pipes to convey the gas are laid on both sides of the streets, under the foot pavements, so as not to interfere with the water-pipes, and extend to more than 110 miles in length.

In generating gas for the supply of Glasgow, upwards of 9000 tons of coals are annually consumed. The coke which remains after extracting gas from cannel coal, and the tar deposited on the cooling of the gas, are used for heating the retorts, and are found to be very economical fuel. Nor is the tar the only one of the liquid products that is turned to profitable account. The ammoniacal water is sold to be used in making cudbear dye, and the naphtha in dissolving caoutchouc for manufacturing waterproof cloth. The solution of lime, after having been employed for purifying the gas, is allowed to stand until the heavier part is precipitated. This is then collected and sold for manure; and the liquor which remains (none of the gas-works refuse is allowed to run into the common sewers of the city) is evaporated

under the great bars of the retort-furnace, thereby increasing the draught, and consequently the intensity of the fire.

As at other establishments, the gas is purified with lime; but, in addition to this process, it is made to pass through a solution of sulphate of iron, by which it is very much improved in purity. After being purified, it passes through a meter of a very large size, made by Mr. Crosley, of London, the patentee. Here the gas manufactured is measured; and by a beautiful contrivance called a tell-tale, which acts by the combined motions of the meter on a common clock, the quantity passing through each hour of the day or night is registered, and the extent of any irregularity in the workmen, as well as the time at which it happened, is at once detected.

The Company have been peculiarly fortunate in procuring the services of Mr. James B. Neilson, Engineer, patentee of the iron hot-blast. To the scientific attainments of this distinguished Manager the Company are chiefly indebted for their uncommon success, and for the most perfect and beautiful establishment of the kind in the kingdom. In May, 1835, the Directors of the Company drew up, printed, and circulated a short history of their affairs, of which the following is an abstract: In the Act of 1825, the Company became bound that the dividends should not exceed 10 per cent. on their stock per annum. From the commencement of the undertaking, they supplied the city and suburbs of Glasgow with gas, at prices below what were charged in any other city in the Empire. In 1818, the period at which the lighting of the city commenced, the charge for a single jet to eight o'clock was 12s. per annum. Since that period, the Company have been enabled to make four successive reductions of the rates. In 1819, they reduced the rates £1800 per annum; in 1822, £1200; in 1830, £2300; and in 1833, £1600. The charge for a single jet lighted to eight o'clock is now reduced to 6s. 6d. per annum. The aggregate amount of the rates paid by the consumers in 1835 is £30,000; and the number of payers about 10,000.

The Old Gas-Works at Hamilton.

A gas-work on a very elegant plan was erected in Hamilton by subscription in the summer of 1831, at the expense of £2400. Three hundred £10 shares were subscribed, of which only £8 has been uplifted; and, from the advance in the price of such shares as have been transferred, there is a fair prospect of the subscribers being liberally remunerated for their outlay. From experiments made at this work by Mr. Burns, the present Manager, it appears that a cubic foot of the richest cannel coal produces about 400 cubic feet of gas. The price of gas when sold by meter is 10s. per 1000 cubic feet, or 1s. per 100 cubic feet. Every cubic foot is nearly equal to 5 imperial gallons. Of course, 500 imperial gallons only cost 1s., which is at the rate of about 3d. per puncheon. Besides private lights, there are now about 130 gas-lamps illuminated throughout the town for nine months in the year, from sunset to sunrise with the exception of five nights at each full moon.

GAS-WORKS PITCH INDUSTRIES AND CANCER.

It was stated in the "JOURNAL" for Dec. 31 last (p. 1040) that, objections having been raised to the regulations drafted by the Home Office for application to people engaged in the manufacture of patent fuel with the addition of pitch, the Home Secretary had directed an inquiry to be held by Mr. A. H. Lush, Barrister-at-Law, whose report was noticed in our issue of Sept. 19, 1911 (p. 744). Towards the end of the inquiry, a proposal was made that, before the regulations were finally settled, time should be allowed for experiments to determine the various questions left undecided; and the period was understood to be twelve months. The inquiry was re-opened last Tuesday at Swansea, when the results of many tests and experiments carried on in patent fuel works, with the object of seeking to reduce the special liability to disease, were outlined. The evidence of most interest to "JOURNAL" readers was given by Dr. Hugh Campbell Ross, who dealt with the subject of gas-works pitch and cancer. He stated that he had been engaged in researches into cancer, and since 1911 with a specific view to the inquiry. His experiments showed that blast-furnace pitch did not produce cancer as gas-works pitch did. He believed the harmful qualities in pitch were not derived from the process of manufacture, but primarily from decayed vegetation. Experiments had been made with a view of separating the harmful substances by washing the pitch; and from an experimental point of view this was successful, but it spoilt the pitch commercially. Though he had not been able to satisfy himself beyond doubt that he could extract the deleterious substances or destroy them, the experiments were so promising that he believed with further investigation a satisfactory solution would be arrived at. Dr. Jabez Thomas, of Swansea, also gave evidence. He said nineteen cases of pitch cancer had been certified at Swansea since the last inquiry; the patients numbering fourteen. He believed that if the warts were treated at an earlier stage, the epithelamatous growths would not be seen as they were now. The inquiry was adjourned.

GLASGOW WATER SUPPLY.

Extension Scheme.

At a Special Meeting of the Water Committee of the Glasgow Corporation on Friday, it was resolved, in view of the rapidly growing requirements of the population included within the area of the municipal supply, to recommend the extension of the Loch Katrine waterworks by the acquisition of the water rights of Loch Voil and Loch Doine, and to construct new water-works.

The supply at present available from Loch Katrine is 67,000,000 gallons per day. The inclusion of Loch Arklet, the works for which are nearly completed, will add another 12,000,000 gallons, which, with

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the 5,000,000 gallons from the Gorbals works, makes a total at present of 84,000,000 gallons a day. It is estimated that the Loch Voil and Loch Doine scheme will bring in between 40,000,000 and 50,000,000 gallons, bringing up the total to over 130,000,000 gallons, which will be ample for the possible future requirements of the city and district. At present the daily consumption of water is 72,000,000 gallons to an estimated population of 1,132,000. The consumption is increasing at the rate of 1½ million gallons daily each year; so that it is estimated that in eight years the demand will be equal to the present available supply of 84,000,000 gallons. It would take this time before the Balquhidder scheme could be completed, allowing for negotiations, parliamentary procedure, and construction of works. The last mentioned include the making of a dam at the east end of Loch Voil and the construction of an aqueduct about six miles in length, mostly tunnelling, through the mountains to Loch Katrine; the outflow being about midway down the loch, nearly opposite the Royal Cottage and a short distance above Brenachoil.

The catchment area from which water flows into Loch Katrine is 23,000 acres in extent; while that of Lochs Voil and Doine is 24,000. As, however, no compensation water is given from the former, and a considerable amount will require to be given from the latter, a less supply will be available for Glasgow than would otherwise be the case. Balquhidder lochs are 414 feet above sea level, and 41 feet higher than that of Loch Katrine. Loch Voil is about three miles in length.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Mr. W. R. Twigg, of the Davis Gas-Stove Company, Limited, has been making a tour of the principal Scottish towns, including Aberdeen, Dundee, Perth, Glasgow, Edinburgh, and Dunfermline, where he has given a practical demonstration of the working of the "Shadowgraph" test for gas-stoves. The lecturer did not, however, confine himself entirely to the demonstration of the "Shadowgraph," but took the opportunity of referring to the construction of gas-stoves. An interesting point during the lecture was the removal by the assistant of the different gas-stoves, put under test, by clasping the metal at the sides of the stoves with bare hands. One could not forget how impossible this would have been with the type of stove in vogue only a few years back; and it furnishes a proof of the utilization of the heat in the proper place, so as to obtain the largest proportion of this heat in the radiant form. The new pattern stove showed the taper "fuel" adopted by the firm. It was noticeable that when the stove was lighted the fuel was heated throughout its entire length.

Arbroath.—The meeting of the Works Committee on March 6 was for the examination of the plans for the new vertical-retort bench, and their approval, before they were submitted to the Dean of Guild Court. The site was also examined and approved of, and the plans are to be presented to the Court at once. The Manager (Mr. A. Young) reported that bores had been made, and these had been carried down as far as 18 feet. The report had, upon the recommendation of the Contractors, been laid before Messrs. F. A. Macdonald and Partners, of Glasgow, with the view of preparing and supplying specifications for ferro-concrete foundations. The ground being doubtful, the Engineers undertook that with these foundations, prepared in accordance with the specifications to be supplied by them, they would be sufficient for the weight to be sustained. A local firm and a few outside contractors are to tender, and the Sub-Committee are to submit these to the full Committee at their next meeting.

Campbeltown.—The burgh have been testing a trial installation of some 36 "A and M" automatic street lighting controllers, which have been fitted up in various exposed districts of the town. After a period of about six months, the Council have decided to proceed with the fitting up of all the lamps of the burgh, which total about 260, with these controllers in the early spring.

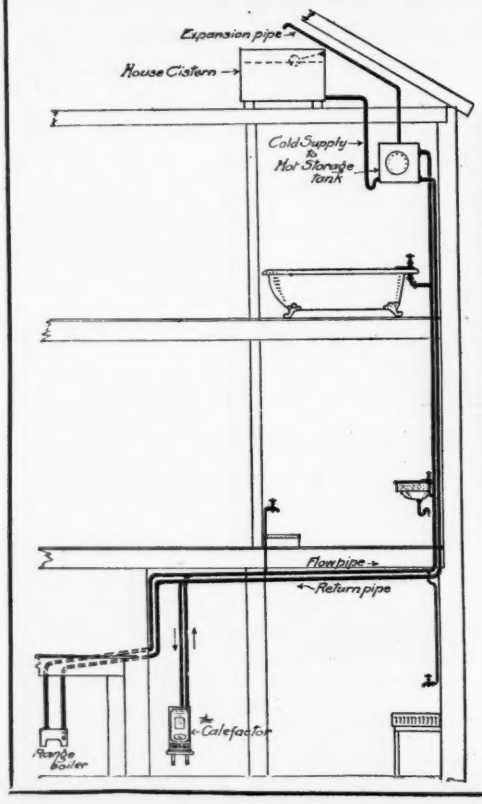
Dalkeith.—To enable the burgh to have a sufficient supply of water which shall be adequate for many years to come, a borehole 300 feet deep and 9 inches in diameter has been made; and tests show that 180,000 gallons of water of a thoroughly satisfactory nature will be available daily. Mr. J. S. M'Dougal, the Burgh Surveyor, has installed a large turbine, utilizing the water of the North Esk River, to provide 27 H.P., and an air-compressing plant and a vertical triplex single-acting power pump to deliver the water into a concrete tank capable of holding 10,000 gallons. From there it is to be pumped to the water-tower at Eskbank, where it will be mixed with the other supplies before delivery to the main pipes.

Dufftown.—At the monthly meeting of the Town Council on Tuesday, it was reported that Mr. M'Leod, of the Clyde Valley Electric Company, had agreed to report to the Council on an electric light scheme for the burgh, and that Mr. Barker, Gas Manager, of Nairn, had agreed to report on a scheme for gas.

Dunoon.—The Finance Committee of the Town Council have decided upon extensions at the gas-works; and £11,000 is to be borrowed to meet the cost of the installation. The offer of West's Gas Improvement Company, amounting to £9740, is to be accepted. Other work will consist of station meter, washer, scrubber, coal-shed, and roof, boundary wall, and a new entrance, which are estimated to cost somewhere about £700.

Duns.—At the monthly meeting of the Town Council, a letter was read from the Duns Gas Lighting Company, in which the Directors pointed out that, until the reconstruction of the works was fully completed, it was difficult to secure a regular pressure. When things were in proper working order, however, there would be no cause for complaint. Considerable discussion took place over the difference in price between the gas used for lighting and that used for cooking, amounting to 1s. 8d. per 1000 cubic feet—the lighting gas being charged at 5s. 5d. It was considered that the 5 per cent. which the Corporation obtained as discount was insufficient. Suggestions were also made as to having

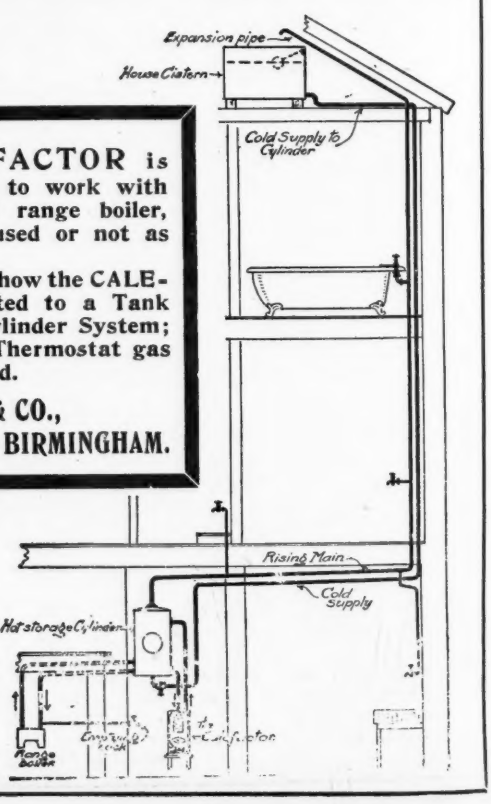
THE CALEFACTOR FOR DOMESTIC HOT WATER SUPPLY.



The CALEFACTOR is easily connected to work with an existing coal range boiler, which may be used or not as desired.

The diagrams show the CALEFACTOR connected to a Tank and also to a Cylinder System; in either case a Thermostat gas valve can be used.

JOHN WRIGHT & CO.,
Essex Works, BIRMINGHAM.



an illuminating power test, and to fix a certain standard. Eventually it was agreed to delay the matter for six months, to enable the extensive alterations to be completed.

Glasgow.—An account of the gigantic scheme which it is proposed should supply 40 to 50 million gallons of water per day is given in another part of the "JOURNAL." It is to be feared that the historic Balquhidder, which is visited by so many, as being for a long time the home and finally the burying-place of Rob Roy Macgregor, will lose much of its beauty when the embankment, which is to raise the lochs 35 feet, is constructed.

Kirkcaldy.—At the last monthly meeting of the Town Council, considerable time was again occupied in discussing the proposed extension of the Corporation gas-works. The Gas Committee recommended the expenditure of over £6000; this being part of the scheme which was to cost £45,000. Mr. Kincaid, in his report, had estimated, as a result of the scheme, that an annual profit of £300 would be obtained after the capital redemption and interest had been paid. Bailie Wright, the Convener, pointed out that the extension was necessary so that the business should be developed and the price of gas kept down. Councillor Napier, on the other hand, proposed that matters be delayed and a *plébiscite* of the ratepayers taken.

Lanark.—At the monthly meeting of the Lanark Town Council, the Special Committee on the proposed purchase of the Lanark Gas-Works submitted a minute, in which there was a recommendation, to offer the Lanark Gas Consumers' Company a stated sum for the whole works, plant, stock-in-trade, &c. The Provost suggested that as in this case they were dealing with third parties, it would be better to take the matter in Committee; and this was agreed to.

Perth.—On Monday night, the Town Council approved of a recommendation by the Gas Committee to borrow £2800 to meet the purchase price of the plant, &c., of the Bridge of Earn Gas Company and relative expenses, and also approved of a recommendation to borrow £4000 for the purchase of a heating apparatus, and to meet other capital expenses. Councillor Allan has intimated to the Town Clerk his resignation of the position of Convener of the Gas Committee. Mr. Allan has been Convener of the Committee since last November, when he took over the position on the appointment of Councillor Clark as City Treasurer. Prior to this, he gained considerable experience as Convener of the Electricity Committee. Councillor Allan's letter resigning his position as Convener of the Gas Committee was considered last Thursday. Ex-Bailies Macpherson, Crombie, and Wright, and Councillor Beaton were nominated for the vacancy, but the two former withdrew; and the voting resulted in the election of Ex-Bailie Wright, who intimated his acceptance, and tendered his resignation of the Water Convenership, to which Councillor Young was appointed.

Wishaw.—Offers have been provisionally accepted by the Town Council for a new gasholder, which will be of the two-lift type, and have a capacity of 338,760 cubic feet, with provision for adding a third lift when it may be required, to bring the capacity up to 515,000 cubic feet. The total estimated cost of the extensions, including the laying of a new main in Kirk Road, is upwards of £9000.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 15.

Sulphate of Ammonia.

The tone of the market for this material has continued dull throughout the week, and once more no quotable change in values has taken place. There has again been a paucity of new orders from direct buyers, but the demand for fulfilling previous contracts for March shipment has been just about sufficient to prevent prices receding further. The quotations at the close are repeated at £14 per ton f.o.b. Hull, £14 1s. 3d. per ton f.o.b. Liverpool, and £14 2s. 6d. per ton f.o.b. Leith. Although it is reported that dealers have been offering for July-December delivery at a discount of 2s. 6d. to 5s. per ton off prompt prices, it is not recorded that they have met with much success; and manufacturers are still quoting spot values over this period.

Nitrate of Soda.

This article remains unchanged at 12s. per cwt. *ex* store for ordinary, and 12s. 1½d. for refined quality, for near delivery.

LONDON, *March* 17.

Tar Products.

The markets for tar products have remained fairly steady during the past week; but business continues on the quiet side. Pitch is firm and maintains its price, though the demand has slackened down somewhat. In benzols, the 90 per cent. quality is a little firmer, possibly on account of the increased inquiry for motor purposes. Naphthas are quiet, though there is no alteration in the price. Crude carbolic is reported to have been sold for delivery over the next few months at lower figures. Creosote remains firm, and there is again a good inquiry.

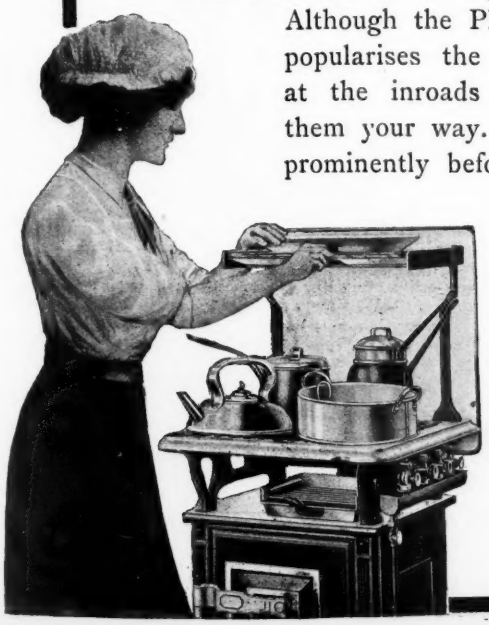
The average values during the week were: Tar, 31s. to 35s. Pitch, London, 50s. to 50s. 6d.; east coast, 49s. 6d. to 50s.; west coast, Clyde, 49s. 6d. to 50s.; Manchester, 49s. to 50s.; Liverpool, 49s. 6d. to 50s. Benzol, 90 per cent., naked, London, 11d. to 11½d.; North, 10½d. to 11d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 5½d. to 5¾d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 1d. to 1s. 1½d.; North, 1s. 1d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3¼d. to 3⅜d.; North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 9d. to 1s. 9½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is still no movement in this article, and business has again been decidedly quiet. For the forward position, contracts are reported

The Importance of the Plate Rack.

The consideration of hiring out Plate Racks as part of your Cooker Hiring Scheme is of growing importance. Every consumer you supply with one will be a big speaking advertisement for Gas Cooking. Although the Plate Rack does not actually consume gas it popularises the gas cooker and strikes by its convenience at the inroads of other methods of cooking and directs them your way. And we know, since we first brought this prominently before the Gas Industry, that it has come to stay. The Richmond **"Universal"** Plate Rack fits any make of cooker.



The Richmond Gas Stove and Meter Company Ltd.

Gas Apparatus Specialists,

London Offices and Show-Rooms: **132, Queen Victoria Street, E.C.**

General Offices and Works: **Academy Street, WARRINGTON.**

to have been taken at lower prices. Outside London makes are quoted at £13 5s. to £13 6s. 3d.; Leith, £14 1s. 3d. to £14 2s. 6d.; Liverpool, £14 1s. 3d.; Hull, £14; Middlesbrough, £14.

COAL TRADE REPORTS.

Northern Coal Trade.

The demand for coal is stronger, as often happens before holidays; and there are firmer prices generally. In the steam coal trade, the inquiry is full; and for best Northumbrians the quotation is now from about 15s. to 15s. 3d. per ton f.o.b. Second-class steams are about 13s. 10d. per ton; and steam smalls are in full request at about 10s. 9d. to 11s. 6d.—the latter being helped in price by the high figures that are quoted in some of the competing districts. In the gas coal trade, there is a keen demand, which fully takes up the production. Best Durham gas coals are from 15s. to 15s. 4½d. per ton f.o b.; second-class kinds are 14s. 3d. to 14s. 6d.; and "Wear specials" about 15s. 6d. Great interest is felt in the large gas coal contracts for the Metropolis. A considerable part of the needs of the two great Companies has been already met, and more is in treaty; but the figures are not yet officially stated. As far as can be learned, the price to be paid is based on about 12s. 9d. to 13s. 3d. per ton f.o.b., according to quality. There are other contracts in course of arrangement at prices delivered in the Thames; but the basis, it is thought, will be about equal to the figures just given. It is hoped that in a week or so these large sales will be substantially settled, and the drift of the market will then be more evident. At present, the tendency is rather upward. Coke is a little scarce. Good gas coke is from 17s. to 17s. 6d. per ton f.o.b.

Scotch Coal Trade.

Throughout Scotland all branches of the coal trade continue to be well employed. On Friday, on the Glasgow Coal Exchange, the following were the prices quoted: Steam coal, 13s. 6d. to 14s.; splint, 15s. to 15s. 6d.; ell, 13s. 9d. to 14s. 6d.; trebles, 14s. to 14s. 6d.; doubles, 13s. 9d. to 14s. 3d.; and singles, 13s. 6d. to 14s., f.o b. Glasgow.

Bradford Water Charges.—The Bradford Water Committee recommended to the City Council, at their meeting last Tuesday, certain reductions in the existing water charges, which will involve a loss of revenue amounting to £5000 a year. It was proposed that the charges for water-closets and baths under a £10 rental should be abolished. In the case of water-closets within the city and in the outside districts with a direct water supply from Bradford, it was suggested that the present charges of 4s. should be reduced by 1s., and that those of 6s., 8s., 10s., and 12s. should be reduced by 2s. A further suggestion was that licensed victuallers should be required in future to take their supply by meter only for all purposes. The recommendations were adopted.

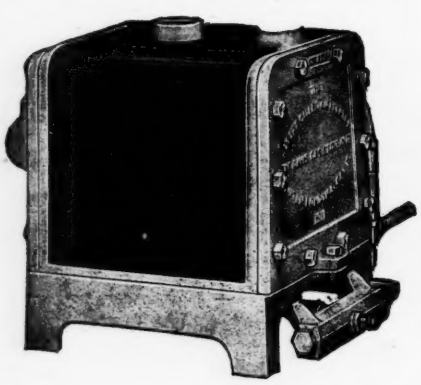
Yorktown and Blackwater Gas Company.

At the annual meeting of this Company last Thursday, the Directors reported a balance of £9138 available for distribution; and they recommended the payment of dividends, with the interim dividends already paid, of 12½ per cent. on the original shares, and 8¾ per cent. on the additional shares. The Directors announced a reduction of 2d. per 1000 cubic feet after the meter readings in July next. In moving the adoption of the report, the Chairman (Mr. D. Sparvell, J.P.), in dealing with the revenue account, mentioned that the receipts from the sale of residuals came to 13s. 11½d. per ton of coal carbonized, which, he said, was most satisfactory, and spoke well for the care taken in the business by the Secretary (Mr. S. Rowe) and the Works Manager (Mr. C. Meiklejohn). During the year the Company had made 86 million cubic feet of gas, of which the private consumers had taken 59 millions, and there were 20¾ millions taken for public lights and under contracts. The total quantity sold was rather more than 71 million cubic feet, and the unaccounted-for gas was 4,167,900 cubic feet. The amount of leakage was an item into which he generally looked carefully, but he thought those who knew anything about gas companies would agree that the Company's leakage was very moderate indeed. Mr. A. Kitt, in seconding the motion, said he thought the condition of the Company's affairs spoke well for those who had the management of the business. Mr. R. W. Edwards congratulated the Company upon the statement presented, and upon the fact that they had made 13s. 11d. per ton of coal by the sale of their residuals. The report was adopted, and the dividends recommended were declared. The Chairman proposed a vote of thanks to the officials and staff, for the excellent manner in which they had carried out their duties during the year. The vote having been accorded, Mr. Rowe and Mr. Meiklejohn acknowledged it. Thanks were given to the Chairman and Directors for their services, and the proceedings closed.

Minehead Gas Company.—Mr. James Phillips, presiding at the annual meeting of the Minehead Gas Company, congratulated the shareholders on the satisfactory result of the past year's trading. The profit was £1493, and the balance available for distribution £2756. A new setting of eight retorts had been erected, and new scrubbing and washing plant installed, together with pressure-raising plant. For this purpose the balance of 15s. per share on the £1 shares had been called up. It was decided to pay a dividend of 8¾ per cent. on both classes of shares.

Gas and Electricity Supply at Brixham.—The annual meeting of the Brixham Gas Company was held last Wednesday—Mr. W. A. Schultz presiding. The accounts showed a profit of £1866 on the supply of gas and £6 9s. on electricity. The dividends recommended were 10 per cent. on the original shares and 7 per cent. on the additional shares. The report was adopted, on the motion of the Chairman, who congratulated the shareholders on a very profitable year's working, in spite of the advance in the price of coals and the drawbacks of the miners' strike.

Gas-Heated Water.



THE proof of the Circulator is in its DURABILITY.

Durability is the outstanding feature of our GILLED CIRCULATOR, as the majority of Gas Authorities can testify from experience on their districts and from personal inspection of the sample in operation at the undermentioned address. We wish to add YOUR name to the majority.

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(Phone: 636 City. Telegrams: "Degasco Cent, London.")

Hinckley Gas Undertaking.

At the Monthly Meeting of the Hinckley Urban District Council on Tuesday last, a report was presented by the Gas Manager (Mr. F. Lee), in which it was stated that three years ago the gas made was 81,023,000 cubic feet, and for the financial year which would close on the 31st inst. it would probably reach 100 millions—an increase of 23 per cent. During this period the price of gas had been reduced by 3d. per 1000 cubic feet for lighting and cooking, and by 1d. to 3d. for power, &c. The charge for gas for heating purposes had been lowered by 10d. per 1000 cubic feet, with a view to encouraging the use of gas-fires, &c. In addition, meter-rents had been considerably reduced. These reductions meant that consumers were paying about £1000 a year less than they did three years ago. During the period taken, £3007 had been transferred to the general district fund out of profits, £1950 applied in relief of the rates, and £1057 used for the purchase of land near the gas premises. In addition, a saving of £100 to the rates during the past year had been made by lighting the lamps by automatic apparatus. These items meant that the rates would be from 5d. to 6d. more in the pound but for the help of the gas undertaking. The amount of borrowed money on the gas-works had been reduced by £4243—the total liability now being £28,703; and, in addition, all extensions had been paid for out of profits. Replying to a member of the Council, the Manager stated that between £6000 and £7000 had been spent on the gas-works extensions during the past three years. It was mentioned that the Committee had been preparing for eventualities by reducing the capital account. If this had not been done, the account would have stood at something like £50,000, instead of £28,000. There was no town in the county outside Leicester where the price of gas was so low as in Hinckley.

Torquay Gas-Works Assessment.—At a meeting of the Newton Abbot Board of Guardians last Wednesday, Mr. W. Vicary moved that the consent of the Board be given to the Assessment Committee to employ, in conjunction with the Totnes Union Committee, Mr. Ryde, to value the property of the Torquay Gas Company, a portion of which is situate in the Totnes Union. He said the Committee had received notice of appeal from the Company to reduce the assessment by a very large amount. Mr. Horner (the Clerk), in conjunction with the Clerk to the Totnes Board, had looked into the matter, and the Committee regretted to say that they could not come to an agreement with the Company. Neither Committee was prepared to make the very large concessions demanded, in view of the profits of the Company and the high premiums at which the shares stood. They therefore asked that an expert valuer should be appointed, and the case fought if necessary. They might, however, be able to settle the matter without going further. So far as the assessment was concerned, the largest amount related to the Newton Union—£2000, against £1500. The Assessment Committee were authorized to employ Mr. Ryde.

Rushden and Higham Ferrers District Gas Company.

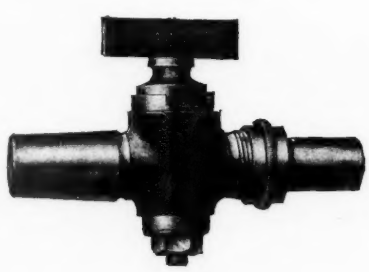
At the recent annual meeting of this Company, the report presented by the Directors showed that the sales of gas during the past year amounted to 107,785,000 cubic feet; being an increase of 9,152,000 cubic feet, or 9¼ per cent., on the previous twelve months. The amount realized was £14,133, or £856 more than before; and the profits were £4519, against £4154. Dividends were recommended at the usual rates per annum—viz., £11 10s. per cent. on the original stock, and £8 1s. per cent. on the additional stock, both free of income-tax. The Chairman (Mr. G. H. Groome), in moving the adoption of the report, said the past year had been one of the most successful in the Company's history, spite of the miners' strike, the advance in the price of coal, and the unseasonable weather; and they could congratulate themselves on having had a record year. Residuals had realized higher prices, and the additional revenue from this source had fully covered the increased cost of coal. There would very shortly be an alteration and renewal of part of the plant, which it was hoped would result in increased efficiency and reduced cost of manufacture, and enable the Directors to reduce the price of gas at an early date. Referring to the proportionate benefits to consumers and shareholders by a reduction, the Chairman pointed out that, taking 2d. per 1000 cubic feet on last year's consumption, £900 would go to the consumers, and only £142 to shareholders in increased dividends. The report was adopted, and the dividends recommended were declared. In moving a very hearty vote of thanks to the Engineer and Manager and his staff, the Chairman said it was undoubtedly due to Mr. Watson's capable management and to the efficiency of his staff that the Directors were able to report so satisfactory a year's working results. Mr. Watson, in thanking the Chairman and Directors for their kind remarks, mentioned that so far the increase in consumption was being maintained; and he expressed the hope that the present year would be as successful as the last had been, if not more so.

Test of the Value of Water Divining.—As the outcome of correspondence which has been going on in the "Sanitary Record" on the well-worn subject of divining for water, arrangements have been made, according to the "Pall Mall Gazette," for a test to be carried out on the 3rd prox., under the supervision of several scientific men, including Professor Henry Adams, Dr. Samuel Rideal, Mr. Herbert Lapworth, Mr. H. D. Searles-Wood, and Mr. William Whitaker, F.R.S. The locality selected for the trial is being kept secret.

Williamstown Gas Company, Limited.—The balance at the credit of the profit and loss account of this Colonial Gas Company at the close of last year was £3280; and the Directors, at the recent half-yearly meeting, recommended the payment of a dividend at the rate of 10 per cent. per annum for the six months ended June 30. This would absorb £1250, and leave £2030 to go to the next account. New carbonizing plant has been put in, and is working satisfactorily. The price of gas has been reduced from 5s. to 4s. 7d. per 1000 cubic feet.

BEST GUN-METAL MAIN TAPS

OBLONG GASWAY.



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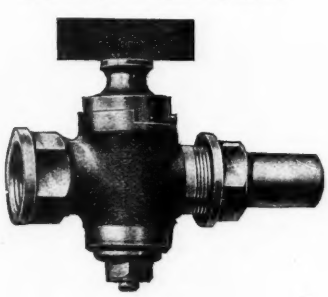
ROUND GASWAY.



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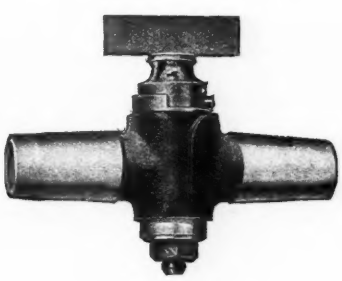
OBLONG GASWAY.



No. 64.

PRICES ON APPLICATION. —

— SAMPLES ON APPROVAL.

MILES PLATTING, MANCHESTER.

SAWER & PURVES

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(BRANCH OF METERS LIMITED).

Scotch Representative: JNO. D. GIBSON, 2. Causeyside Street, Paisley.

Telephone Nos. { 3289 (City) MANCHESTER. 2025 (Central) NOTTINGHAM.

Wires { "SAWER MANCHESTER." "SAWER NOTTINGHAM."

A Co-Partnership Scheme Adopted for Canterbury.

Following the announcement made by Alderman H. Hart, the venerable Chairman of the Canterbury Gas and Water Company, at the recent annual meeting [*ante*, p. 622], in reference to the adoption by the Company of a co-partnership scheme, immediate steps have been taken to put it into operation by calling the men together to explain its object. At the conclusion of the ordinary weekly meeting of the Directors on Monday last week about sixty of the outdoor employees assembled in the retort-house to hear the Chairman give details of the scheme. He was accompanied by the Vice-Chairman (Mr. Silas Williamson), several Directors, the Assistant-Secretary (Mr. J. E. Burch), and the Gas Engineer (Mr. H. C. Page). The Chairman said the Directors were animated with only one feeling in the matter, and that was to draw the men nearer to them, and to show that they appreciated their services. They wanted the workmen to remain with them and to share in the profits. The shareholders had decided to give the employees an opportunity of improving their position by earning an annual bonus, and eventually becoming owners of stock. He hoped the scheme would give them even greater interest in their employment. Asked if they were willing to join in the scheme, the men responded with no uncertain voice. The Chairman then gave details of the scheme, and read and explained the rules governing it. In concluding, he remarked that he looked upon that day as a great one, and he felt very happy that he had health and strength to be among them to start this new era for them.

Belfast Gas Officials' Salaries.—A meeting of the Belfast Corporation in Committee considered favourably recommendations for an increase of £50 in the salary of the Gas Engineer and Manager's Secretary, and of £30 in the salary of an Assistant Accountant. The Superintendent of Mains was recommended for an increase of £50.

Brisbane Gas Company.—The net amount standing to the credit of the profit and loss account of this Company for the six months ended Dec. 31, inclusive of the balance brought forward, was £18,125; and the Directors, at the recent annual meeting, recommended a dividend of 6 per cent. This amounted to £12,480, and the income-tax came to £624; making together £13,104, and leaving £5021 to be carried forward. Plans and specifications for an installation of vertical retorts and other improvements in the works are being prepared.

Lighting of Lewisham Infirmary and Workhouse.—At a meeting of the Lewisham Board of Guardians on Monday last week, the Works Committee recommended that the Board should obtain the services of the Engineer of the South Metropolitan Electric Company to prepare specifications for the electric lighting of the Infirmary and Workhouse, at a fee of £10 10s., and invite tenders for the supply of electricity from the Electric Light Company and from the Gas Company—the latter to furnish it from their own plant. The Board agreed to the recommendations.

Sale of Stocks and Shares.

There was a large attendance at the sale of stocks and shares conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday, when practically every lot offered was sold. The first matter to engage attention was an issue of £10,000 of "D" capital by the Directors of the Barnet District Gas and Water Company. It ranks for a maximum dividend of 7 per cent.; and the existing capital of this class carries £5 19s. per cent. It was all sold at from £117 10s. to £121 10s. per £100. The next lots consisted of some consolidated 10 per cent. stock of the Brentford Gas Company, carrying 14 per cent. dividend; and it realized £270 per £100. By order of trustees, some fully-paid £10 "B" shares, carrying 7 per cent. dividend, in the Sevenoaks Gas Company, fetched £13 5s. each. By instructions from executors, a few £10 fully-paid "C" shares in the Waltham Abbey and Cheshunt Gas Company (standard dividend 7 per cent., but carrying 6½ per cent.) were sold at from £12 15s. to £13 5s. each. Under similar conditions, some 5 per cent. "C" preference stock of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company was sold at par, *cum div.*; and some ordinary 5 per cent. "B" stock, carrying 5½ per cent., at £105 10s. per £100. A small parcel of "B" ordinary 7 per cent. stock of the Woking District Gas Company, carrying 5 per cent. dividend, fetched from £106 to £107 per £100. Some £10 fully-paid original shares in the Ceará Gas Company, Limited (last dividend 10 per cent., tax free), fetched £11 to £11 10s. each; a few 10 per cent. first preference £10 shares, £11 5s. each; some second preference shares (£7 paid), £7 15s. apiece; and a few registered £100 debentures were sold at par. A parcel of fully-paid £5 first preference shares (7 per cent.) in the Malta and Mediterranean Gas Company, Limited, fetched £6 10s. each; some 7½ per cent. second preference shares, a similar amount; and some fully-paid £5 ordinary shares (last dividend 6 per cent.), £4 10s. to £4 17s. 6d. apiece.

The Storage Question at Burnley.—The Gas Committee of the Burnley Corporation have considered the report of their Engineer (Mr. J. P. Leather) on the inadequate gas storage. In this report, which was given in the "JOURNAL" last week (p. 691), the available storage was stated to be only 66 per cent. of the maximum daily consumption. The Committee decided to recommend the Council to authorize them to endeavour to find a site for new gasholders.

Street-Box Explosions in Lisbon.—According to the Lisbon correspondent of the "Daily Mail," an explosion followed by a fire occurred last Thursday night in a manhole in connection with the electric tramway system in the centre of the city. Soon flames burst from dozens of manholes along the streets to the tramway station about two miles away. The explosions caused scenes of panic in the streets, and people rushed for safety into shops and houses. Later another explosion took place, and six men were seriously injured and burnt, among them being Mr. Harry Finch, an English engineer, who is stated to be in danger of losing his sight.

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THE SOUTH MANCHURIAN RAILWAY CO'.S NEW HOTEL, DALNY (JAPAN).

THE PARKINSON STOVE CO., LTD.

BIRMINGHAM & LONDON.

PS

Reduction in Price at Rhyl.—At the meeting of the Rhyl Urban District Council last week, Mr. S. Perks, the Chairman of the Gas Committee, moved a resolution that the price of gas should be reduced 2d. per 1000 cubic feet. He said the time had come when the Council should be just to the consumers. Owing to financial conditions, he had in the past opposed a reduction, though always aware of the justice of the case. Now, however, matters were on a proper footing, and it was time the gas consumers came into their own. Since 1903, there had been handed over to the town from the gas undertaking no less than £17,520 towards the reduction of the rates, while the electric light undertaking cost them £9786 in the same period. The proposal was carried, but by a majority of only one.

Lewes Gas Company.—At the half-yearly meeting of the Company last Wednesday, the Directors reported a sum of £7464 available for distribution; and they recommended that dividends for the past six months be declared at the rate of 5 per cent. upon the original stock and at the rate of 3½ per cent. upon the additional stock. These, after deduction of income-tax, would amount to £1397 In moving the adoption of the report, the Chairman (Mr. M. S. Blaker) said, considering the period of stress through which gas companies had passed on account of coal strikes and the high price of coal, he thought the statement of accounts submitted must be regarded as highly satisfactory. He specially eulogized the work of the Secretary (Mr. H. J. Hillman) and the Manager (Mr. E. Jones), as bearing upon the success of the Company. The report was adopted.

Record Increased Sale of Gas at Lichfield.—At the annual general meeting of the Lichfield Gas Company last Tuesday, the Chairman (Alderman H. M. Morgan) reported a record increased sale of gas to the extent of 4,200,000 cubic feet for the year ending Dec. 31. This was partly due, he said, to the extension of the Company's high-pressure mains to Hammerwich, Burntwood, and Shenstone, and partly to the coal strike a year ago, when, of course, gas was used in lieu of coal. Of the total 1902 consumers using gas, it was of interest to note that 1132 were on the prepayment system. Residuals had produced an increased return. On the other hand, for gas coal of a decent quality an almost prohibitive price was demanded; and the Company had paid £449 more for raw material than in the preceding year. Considerable renewals in the retort-house had taken place during the year; and the Directors were considering further improvements in their manufacturing plant. The accounts presented were unanimously adopted, and the usual dividends declared. Thanks were accorded to the Manager (Mr. F. Key), who, in acknowledging the compliment, drew the attention of those present to the good work being done on behalf of the gas industry in general by the British Commercial Gas Association, with their gas publicity scheme.

Exacting Conditions of Application for an Appointment.—Candidates for appointments in the gas profession are naturally expected to furnish ample particulars in regard to their qualification for the position they are seeking; but we do not remember a case of an applicant being required to present these particulars in tabular form, as though he were making a return to the Commissioners of Inland Revenue for income-tax. A case has, however, just been brought under our notice where this was done. The candidate was expected to answer nine questions of a personal character, and fill up two forms setting forth his experience in keeping gas accounts, gas making and carbonizing, and giving particulars of any occupation other than gas making in which he might have been engaged. These forms were divided into columns for the name of the works or the employer, particulars of the offices held or the nature of the employment, the dates of the commencement and the cessation of duties, duration of the appointment, and cause of leaving. Finally, the candidate was expected to submit copies of not more than three recent testimonials, in his own handwriting, upon a separate sheet accompanying the form of application. No testimonial, letter, or any other paper whatever, was to be sent with the application; but production of the originals of the testimonials was required when the candidate attended before the Directors. As candidates for appointments usually have copies of their testimonials ready for sending in with their applications, we do not see why they should be put to the trouble of re-copying them.

APPLICATIONS FOR LETTERS PATENT.

5269.—Crossley, T., "Gas-lamps." March 3.
5342.—Glasgow, A. G., "Coke screens." March 3.
5348.—Smith, A. T., "Conversion of animal substances into ammonia and combustible gases." March 3.
5413.—Bax, H., "Illuminating premises." March 4.
5426.—Cowper-Coles, S. O., "Lamps." March 4.
5430.—Slack, J. E., and British Mannesmann Tube Company, Ltd., "Service-connectors to pipe-mains." March 4.
5450.—Kent, W. G., "Measuring the flow of fluids." March 4.
5460.—Mellin, M. L., "Measuring heat." March 4.
5480.—Thompson, H. S., and Sutton, C. J., "Mantles." March 5.
5526.—Clark, A., and Bence, E. H., "Connecting branch-pipes to mains under pressure." March 5.
5531.—Kent-Johnston, A. G., "Lighting and extinguishing gas-lamps." March 5.
5574.—Dempster, R., and Sons, Ltd., and Hargreaves, W., "Telpher track switches." March 6.
5616.—South Metropolitan Gas Company and Chandler, D., "Gas-lamps." March 6.
5622.—Piper, E. J., "Gas-fittings." March 6.
5647.—Still, W. M., and Sons, Ltd., and Still, E. H., "Valve for high-pressure gas-tanks." March 6.
5680.—Holmes, J., "Governors and regulators." March 7.
5695.—Behl, A., "Regulating pressure in fall-down gas-pipes." March 7.
5719.—Swanson, T. W., "Gas-burners." March 7.
5762.—Key, J. T., "Automatic lamp-lighter." March 8.
5769.—Brayshaw, S. N. & E. R., "Furnaces." March 8.
5785.—MacTaggart, W., "Joint for pipes." March 8.

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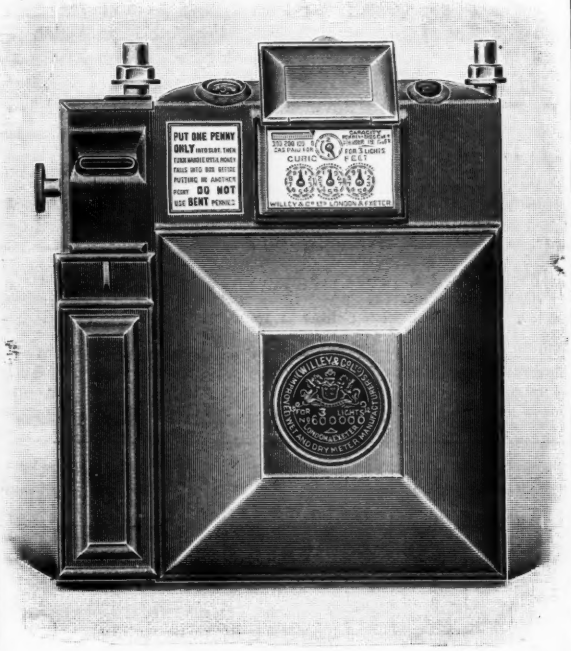

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Strike of Gas Workers at Barrow.—Last week, the men, about 300 in number, employed at the gas-works of the Barrow Corporation came out on strike for an increase of wages.

Explosion at the Milford Haven Gas-Works.—While the Manager of the Milford Haven Gas-Works (Mr. R. J. Calderwood) was engaged, on Monday last week, with the head fitter (Mr. T. James) and two labourers, in making the connections to some new purifiers which had recently been put in, an explosion occurred, which caused rather serious injuries to Mr. Calderwood and the fitter, who were burnt about the head and the upper part of the body. The labourers, however, were less badly burnt.

Gas Workers' Wages Advanced at Bradford.—The Gas Committee of the Bradford Corporation have decided, subject to the approval of the City Council, to increase the wages of several classes of employees. Stokers and coke wheelers are each to receive an advance of 2d. per shift—in the former case from 5s. 6d. to 5s. 8d., and in the latter from 4s. 8d. to 4s. 10d. Several other classes of men receive an addition of ½d. per hour, and lamplighters are given an extra 1s. per week. The advances will amount altogether to between £1500 and £1700 a year.

The Supply of Electricity at Truro.—At the meeting of the Truro City Council last Tuesday, the Mayor (Mr. W. G. Goodfellow) referred at some length to the Board of Trade inquiry on the rival schemes of the Corporation and the Gas Company for the supply of electric light in the city, a report of which was given in the "JOURNAL" last week (p. 688). His Worship said the Gas Company presented the weakest case that had ever been before the Board; and the proceedings ended practically with the intimation that the Corporation would get the Order with the inclusion of the Winchester clause. He regretted the expense which had been incurred, and it never ought to have happened. He was surprised that the Directors and others connected with the Gas Company should have been led to believe that they were going to get the Order.

Additional Capital for the Monte Video Water Company.—At the ordinary general meeting of the Monte Video Water Company last Thursday, at which the report, noticed last week (p. 705) was adopted, the Directors were authorized to borrow such a sum as, together with the first and second debenture stocks already issued, should not exceed the issued capital of the Company.

Devon Gas Association.—The Directors of the Devon Gas Association (who own gas-works at Buckfustleigh, Chagford, Chudleigh, Moreton, Northtawton, South Brent, and Sturminster Newton) report that the accounts for the past year show gratifying increases despite the high price of coal. On a gross profit of £947, they recommended the payment of a dividend of 5 per cent., besides placing £100 to the reserve fund.

Effect of the Gas Workers' Strike at Sydney.—Telegraphing on Monday last week, the Sydney Correspondent of "The Times," said: "The settlement of the gas strike is wholly and avowedly at the expense of the consumers, and is much criticized. The Sydney 'Daily Telegraph' says that the 'strike arrangement leaves the public to reflect grimly that it finances industrial peace.' It is now clear that the Gas Companies, after a reduction of the price of gas to 3s. 6d. per 1000 cubic feet, enforced by the Gas Act, increased the salaries of their clerical staffs, and gave each of the Directors an extra £1000 annually; but when the gas-works staff renewed their demand for an increase in wages, the Companies refused to grant it, except under conditions legally enabling them to pass on the whole of the cost to the consumers. The decision of Mr. Justice Heydon, President of the Arbitration Court, that these conditions were unobtainable under the existing Arbitration Act caused the strike; and the Government's promise to amend the Act so as to obtain the conditions has ended it. The final result will be the restoration of the former rate against the consumer, while the Directors and all the employees gain a substantial increase in wages."

GAS COMPANIES' STOCK AND SHARE LIST.

There were not many bright points about Stock Exchange business last week, but markets were not quite so feeble as they had been the week before. Apart from the prolonged uncertainty regarding international questions and forced sales pressed by Continental bourses, the gilt-edged market was disquieted by new loans and issues, labour unrest was not wholly allayed, and money still ruled tight. On the other hand, markets were free from apprehension of internal difficulties, and could wait without alarm, howsoever dissatisfied at having no work to do. The opening was bad—taking its tone from the close of the previous week—and prices seemed to find no bottom. Government issues were weak, and Consols fell ¼. Rails drooped continuously; and Americans were much depressed. Tuesday, however, saw a pleasant change before the close, though shy at first. Consols recovered ⅛, Rails were a little uneven, but better on the whole, and Americans firmer. Cheerfulness was maintained fairly on Wednesday; the aspect of foreign affairs being viewed as more favourable. Consols rose ⅛; and all the leading markets were firmer. Thursday was not so good, and markets were unsteady; but there was too little business doing to show much change. Friday was dead quiet, dull, and uninteresting. Gilt-edged were weaker, Rails had a few sluggish movements, and Americans see-sawed up and down, closing lower. Saturday was absolutely inanimate; the complete stagnation of business being quite depressing. Government issues were weaker, and Consols gave way a little for the account, but closed at 73¼ to 73½ for money—the same price as the Saturday before. In the Money Market, there was a strong demand for Stock Exchange and other purposes. Discount terms hardened up to a point and then relaxed somewhat. The improved activity in the Gas Market which was mentioned last week was fairly well maintained, though only the premier Company quite equalled its average score of transactions. The general tendency was satisfactory, though certainly not all the changes in quotation were in the upward direction. In Gaslight and Coke, the ordinary was repeatedly dealt in and at very steady figures, ranging from 101½ to 102⅛—practically the same limits as the week before. In the secured issues, the maximum was done at 81½, the preference at 96 to 98, and the debenture at 74⅛—a fall of 1. South Metropolitan was almost wholly neglected; four deals at 112¼ to 113 being the sum total. The debenture marked 74½. Nothing was done in Commercials; but each capital issue was put up a point. Among the Suburban and Provincial group, Alliance and Dublin realized 77¾, Brentford new 203 and 204, Brighton original 206, ditto ordinary 152, British from 45⅞ to 46⅛ (a rise of ⅛), South Suburban 118½, and (on the local Exchange) Liverpool "B" 155½. In the Continental companies, Imperial changed hands at 172 to 174, ditto debenture at 86 and 86½, Union at 84½ and 85, European at 18 to 18⅜ (a fall of ⅛), and Tuscan at 6 and 6⅛—a fall of 1. Among the undertakings of the remoter world, Bombay made 6⅜, Melbourne 100¾, Oriental 128, Primitiva preference 4 15/16 and 5 (a fall of ⅛), River Plate debenture 93½, and San Paulo preference 11 9/16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75—80	..	6 5 0
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	83—86	..	4 13 0
280,000	5	Oct. 11	7½	Bombay, Ltd.	6½—7	..	5 7 2
50,000	10	Feb. 27	15	Bourne- mouth Gas & Water: 10 p.c.	28½—29½	..	5 1 8
332,000	10	,,	7	B 7 p.c.	15½—16½	..	4 6 8
75,000	10	,,	6	Pref. 6 p.c.	13½—14½	..	4 4 3
880,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	205—210	..	5 4 9
244,200	,,	,,	8	Do. A Ord. Stk.	150—153	..	5 4 7
530,000	20	Sept. 27	12½	British	45⅞—46⅛	+⅛	5 8 1
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	89—91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	92—94	..	4 5 1
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	107½—109½	..	4 11 4
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	104—106	+1	5 3 1
660,000	,,	,,	5⅛	Do. 3½ p.c. do.	101—103	+1	5 3 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	84—87	..	4 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5½	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	18—19	−½	5 5 3
16,415,840	Stk.	Feb. 13	4/17/4	Gas-light and Coke: 4 p.c. Ord.	101—103	..	4 14 7
2,600,000	,,	,,	3½	3½ p.c. max.	80—83	..	4 4 4
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	..	4 0 10
4,674,850	,,	Dec. 12	3	Coke 3 p.c. Con. Deb.	74—77	−1	3 17 11
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	89—91*	+½	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16½—16⅝	..	6 11 4
131,000	Stk.	Mar. 13	7⅝	Ilford A and C	152—155*	+1½	4 18 4
65,780	,,	,,	6⅛	Do. B	120—122*	+1	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,060	Stk.	Nov. 14	9	Imperial Continental	171—176	..	5 2 3
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	85—87		4 0 6
200,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.	120—123*	+1	4 17 7

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 27	10	Liverpool United A	218—220	..	4 10 11
718,100	,,	,,	7	Do. B	155½—157½	..	4 8 11
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4¼—4⅝	..	6 6 4
250,000	100	Oct. 1	4½	Met. of Melbourne: 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	Oct. 30	3½	Monte Video, Ltd.	12¾—13¼	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.	100½—101½	..	4 9 9
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	85—86	..	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.	13—14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	125—130	..	6 3 1
60,000	5	Sept. 27	10	Ottoman, Ltd.	8¼—8⅝	..	5 14 3
60,000	50	Feb. 27	13	Portsea, Island B	125—128	..	5 1 7
100,000	50	,,	12	Do. C	122—125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.	6½—7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	4¼—5⅛	−⅛	4 17 7
521,600	100	Dec. 2	4	,, 4 p.c. Deb.	96—98	..	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	92—94	..	4 5 1
275,000	5	Apl. 12	12	San Paulo, Ltd.	13—14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Aug. 29	10	Sheffield A	232—234	−2	4 5 6
209,984	,,	,,	10	Do. B	230—232	−1	4 6 2
523,500	,,	,,	10	Do. C	230—232	..	4 6 2
90,000	10	Sept. 27	7½	South African	10—11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	112—114	−½	4 15 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	74—77	..	3 17 11
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.	160—162	..	5 4 11
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.	117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	115—117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	117—119	−1	4 4 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham and Edmonton: A 5 p.c.	139—142	..	5 2 1
483,940	,,	,,	5½	B 3½ p.c.	114—116	..	4 19 2
149,470	,,	Dec. 30	4	4 p.c. Deb.	92—94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.	5—6	−1	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	96—98		5 2 0
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.	115—116	+1½	4 6 2
255,636	Stk.	Mar. 13	6⅞	Wands-worth: B 3½ p.c.	137—140*	..	4 18 2
85,766	,,	Dec. 30	3	3 p.c. Deb. Stk.	68—70	..	4 5 9

Prices Marked * are "Ex. Div."

Craven Arms Water Supply.—Last Tuesday, an inquiry was held at Craven Arms, by Mr. W. O. E. Meade-King, M.Inst.C.E., one of the Inspectors of the Local Government Board, in regard to the application by the Rural District Council of Ludlow for sanction to borrow sums amounting to £1300 for purposes of water supply for Craven Arms in the contributory places of Halford and Stokesay. The proposal of the Council is to put down a new borehole in the vicinity of the present one; and the matter has been reported upon by Messrs. Willcox and Raikes.

New Plant at Tiverton Gas-Works.—At their meeting last week, the Tiverton Town Council had under consideration a recommendation by the Gas Committee that tenders submitted by Mr. T. Carter for reconstructing retorts and by Messrs. Willey and Co. for the supply of a new condenser and washer should be accepted. Mr. Martin thought they were proceeding on wrong lines in reference to this and other extensions of the works. He said it seemed ridiculous to be making profit and accumulating a sinking fund, and then when work of this character was necessary to have to borrow money. They gave £22,000 for the undertaking, and owed about the same amount to-day. The Borough Accountant (Mr. J. Siddalls) pointed out that if they went on extending they must spend more money. Alderman J. Thorne, the Chairman of the Gas Committee, remarked that, as a matter of fact, they had no working capital, and no fund on which they could draw. Originally, they were allowed to borrow £22,000 only; and the purchase price of the concern absorbed every penny of it. Since then the works had been added to from time to time, and the current expenses had had to be provided out of capital and by means of an overdraft at the bank. They had nearly come to the end of the provision for the first large loan. The undertaking had been run in the interest of the consumers, and the price of gas reduced whenever possible. They felt, however, in regard to permanent improvements, that those who came after them and would share the benefit should also share the cost. The recommendation was approved.

The West Bromwich gas undertaking has had another very successful year, and the Committee have decided to contribute out of the profits £500 in relief of the rates of the borough.

Complaints in regard to the quality of gas supplied from the Thornton Road works of the Bradford Corporation have recently been made; but the Gas Engineer (Mr. Charles Wood) has found, on inquiry, that, as usual, it is the consumers who are at fault for using defective burners. In one case the burners had not been replaced for 27 years.

At the meeting of shareholders of Messrs. C. & W. Walker, Limited, on the 27th inst., the Directors will report that the profit of the year ended the 31st of January, after charging their fees and depreciation on the buildings and plant, amounts to £8364. Adding the balance brought forward produces £15,942, which the Directors recommend should be dealt with as follows: Dividend already paid (at the rate of 5½ per cent. per annum on the preference and 10 per cent. per annum on the ordinary shares), £3100; final dividends at above rates, £3100; carried to reserve (making it £28,000), £1000; and carried forward, £8742.

Messrs. Biggs, Wall, and Co. have secured a contract for an installation of their "Rapid" manual charging machine at the Tenby Gas-Works, and also at the Chippenham Gas-Works.

Messrs. A. H. Ball and Co., Limited, of Farnham, Surrey, have secured contracts for laying larger trunk mains for the Merthyr Tydfil Gas Company, and for the extension of mains for the Petersfield and Selsey Gas Company.

At the meeting of the Colwyn Bay Urban District Council last Tuesday, the Gas Manager (Mr. J. Smith) reported that the carbonizing for the past year worked out at about 13,000 cubic feet of gas per ton of coal, which was a satisfactory result.

The Burton-on-Trent Town Council have, on the recommendation of the Gas Committee, continued the appointment of Mr. J. Ferguson Bell, of Derby, as Consulting Engineer, for a period of twelve months. Alderman T. E. Lowe, the Chairman of the Committee, remarked that Mr. Bell kept in touch with the work of the Committee, attended meetings when necessary, and assisted in buying coal, &c. In the latter direction alone, his services were well worth retaining.

Inquiry into an electric light failure recently, revealed the fact that on this occasion a familiar occurrence was attributable to an unusual cause. The failure took place this time at Cardiff; and the explanation offered at a subsequent meeting of the Electric Lighting Committee was that "the works cat climbed the switchboard and strolled along the cables," with the result that one of them became fused. Several buildings were plunged in darkness; but on one point the consumers are reassured. This particular cat will climb no more.

On the minutes of the Gas and Water Committee coming up for adoption at the meeting of the Widnes Town Council last Tuesday, Mr. Miller asked if it was true that, in consequence of the Gas Committee having refused to entertain the application of the Engineer (Mr. Isaac Carr) for commission on the extensions to the gas and water undertakings, which were to cost £56,000, he had threatened to resign. He said the matter was being discussed in public; and he thought the Council should have some information on the point. The Deputy-Mayor (Alderman Smith) replied that the question was not on the minutes, and could not be discussed.

The report to be submitted at the meeting of the Davis Gas-Stove Company to-day states that the net profit for the year to Dec. 31 amounted to £25,131; and adding the sum of £4957 brought forward, there is a divisible profit of £30,088. From the amount remaining after paying the dividend on the 5½ per cent. preference shares and an interim dividend on the ordinary shares at the rate of 5 per cent. per annum, it is proposed to declare a dividend on the ordinary shares at the rate of 15 per cent. per annum (less income-tax) for the second half year—making 10 per cent. for the year; to add £14,000 to the reserve account—making it £50,000; to provide £1620 for the proportion of profits payable to the Directors; and to carry £5345 forward. The Directors record with the greatest regret the death of the late Chairman, Mr. Henry J. Davis; and they announce that Mr. C. S. Barber has resigned his position as Secretary and also vacates his seat on the Board.

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WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. York Gas Company. Applications by March 31.
GAS-WORKS FOREMAN. Dumfries Corporation. Applications by March 26.
FOREMAN (Hot-Water Installations). No. 5710.
WORKING FOREMAN. Cannock, &c., Gas Company. Applications by March 24.

Agencies Wanted.

"ENGINEER," c/o Winston, 77, Blinco Grove, Cambridge.

Plant, &c. (Second-Hand), For Sale.

LAMP-COLUMNS AND LANTERNS. No. 5708.
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PURIFYING MACHINES. No. 5709.

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EXHAUSTER AND ENGINE. No. 5704.

Patent Licences, &c.

GAS PRODUCER. Haseltine, Lake, and Co., Chancery Lane, W.C.

Tank Trucks for Hire.

FREDK. G. HOLMES AND CO., Northfleet.

Stocks and Shares.

BISHOP'S STORTFORD, &c., GAS AND ELECTRICITY COMPANY. By Auction. Chequers Hotel, Bishop's Stortford. March 27.
BRIGHTON AND HOVE GAS COMPANY. London Mart. April 1.
BROKEN HILL WATER SUPPLY. London Mart. April 1.
GRAVESEND AND MILTON WATER COMPANY. London Mart. April 1.
HERNE BAY GAS COMPANY. London Mart. April 1.
HORNSEY GAS COMPANY. London Mart. April 1.
HUNGERFORD GAS COMPANY. London Mart. April 1.
NORTH MIDDLESEX GAS COMPANY. London Mart. April 1.

TENDERS FOR

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NEWPORT (FIFE) GAS DEPARTMENT. Tenders by April 2.

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WANDSWORTH, &c., GAS COMPANY. Tenders by March 28.

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Fire Clay Goods.

LIMERICK GAS DEPARTMENT. Tenders by April 7.

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Tar.

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See Illustrated Advertisement Feb. 11, p. 428.

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